THE 'ECO-NESS' OF ECO-ESTATES IN SOUTH AFRICA

by

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DECLARATION

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ABSTRACT

It is widely acknowledged that a need exists to live in harmony with nature to attain a just balance between the social, economic and environmental needs of present and future generations. The need to consider alternative and sustainable forms of residential development that are in harmony with nature is vital. Gated communities have become a popular form of residential housing across the South African landscape. In response to this popularity a niche market eco-estates – has emerged as a type of 'green' lifestyle estate in South Africa. Since eco-estates are purpose-built to be sustainable, an investigation of these eco-developments is called for, especially regarding future generations attaining the vision of living in harmony with nature.

Using a mixed-methods approach, the study aimed to investigate whether estates that are branded as eco-estates are different to those described in their marketing material as being eco-friendly. The five objectives were to provide a literature review of the relevant literature; to do a locational analysis of eco-estates and eco-friendly estates in South Africa; to determine whether eco-estates and eco-friendly estates are located contiguously with existing conservation areas; to investigate the degree to which eco-estates and eco-friendly estates contribute to greening interventions; and to create a categorisation of eco-estates and eco-friendly estates.

The results indicate that these estates require wide, open spaces to ensure their success and are therefore located on urban peripheries or in smaller towns or secondary cities where ample space is available. The estates were found to be located adjacent to some type of protected area or next to another eco-estate. However, the objective of creating contiguous protected areas was often distorted due to the presence of walls, boundaries and fences where security precautions override conservation priorities.

All the estates studied were found to adopt some kind of green intervention related to energy, water and waste. However, very few of the estates have made these practices mandatory, thus making their eco-ness and sustainability questionable. The study proposed a categorisation of eco-estates in South Africa which places these developments on a continuum ranging from a true eco-estate to lower forms of eco-estates. In essence, while these estates are branded similarly, there is a fundamental difference between the two. Security is the major priority for both eco-estates and eco-friendly estates, followed by conservation priorities.

It is recommended that there is a need for a suitable definition of eco-estates a legislative framework to guide new eco-developments to be successful. Developers, government officials and planners will have to cooperate in creating a developmental framework for eco-estates. Eco-estates

are an alternative form of development which is better than conventional developments in facilitating living in harmony with nature. However, they will only be successful if developed according to the true notions of sustainable development and in a just manner.

Keywords: conservation development, eco-development, eco-estate, eco-friendly, eco-ness, eco-urbanism, gated community, green building, greening interventions, nature, sustainable development

OPSOMMING

Dit word wyd erken dat daar 'n behoefte is om in harmonie met die natuur te leef ten einde 'n regverdige balans te bewerkstellig wat sosiale, ekonomiese en omgewingsbehoeftes van huidige en toekomstige geslagte betref. Die noodsaaklikheid bestaan om alternatiewe, volhoubare residensiële ontwikkelingsvorme te oorweeg wat in harmonie met die natuur is. Omheinde ontwikkelings het 'n gewilde vorm van residensiële behuising oor die Suid-Afrikaanse landskap geword. In reaksie op hierdie gewildheid, as 'n nismark, het ekolandgoedere ontstaan as 'n soort 'groen' leefstyllandgoed in Suid-Afrika. Aangesien ekolandgoedere se doelwit is om volhoubaar te wees, word die ontleding en ondersoek van ontwikkelinge wat verwys na eko-ontwikkelinge op die een of ander manier as belangrik geag. Dit geld veral vir toekomstige geslagte om die visie van lewe in harmonie met die natuur te bereik.

Deur gebruik te maak van 'n benadering van gemengde navsoringmetodes, is die studie daarop gemik om te ondersoek of landgoedere wat as ekolandgoedere beskryf word, verskil van landgoedere wat beskryf word as 'ekovriendelik' in hul bemarkingsmateriaal. Die studiedoelwitte is vyfvoudig: Om 'n literatuuroorsig van die relevante literatuur te verskaf; 'n tyd-ruimtelike analise van ekolandgoedere en ekovriendelike landgoedere in Suid-Afrika te verskaf; te bepaal of die ligging van ekolandgoedere en ekovriendelike landgoedere aangrensend is aan bestaande bewaringsgebiede; te ondersoek tot watter vlak ekolandgoedere en ekovriendelike landgoedere bydra tot groen intervensies; en om 'n kategorisering van ekolandgoedere en eko-vriendelike landgoedere te skep.

Die resultate dui daarop dat hierdie eko-landgoedere wye oop ruimtes benodig om hul sukses te verseker en is dus geleë in die stedelike periferie of in kleiner dorpe of sekondêre stede waar genoeg ruimte beskikbaar is. Daar is bevind dat eiendomme langs 'n beskermde gebied of ander ekolandgoed geleë is. Die doelwit agter geskepde aangrensende beskermde gebiede word egter vervorm as gevolg van die teenwoordigheid van mure, grense en heinings aangesien veiligheidsprioriteite die bewaringsprioriteite oorskadu.

Daar is bevind dat dei langoedere in hierdie studie sekere inisiatiewe ten opsigte van die bestuur van energie, water en afval het. Baie min van die landgoedere het hierdie praktyke egter verpligtend gemaak, en sodoende hul ‘ekoheid’ en volhoubaarheid bevraagteken. Die studie bied 'n voorgestelde kategorisering van ekolandgoedere in Suid-Afrika. Die kategorisering plaas hierdie ontwikkelinge op 'n kontinuum wat strek van 'n ware eko-landgoed tot laer vorme van eko-landgoedere. In wese, terwyl hierdie landgoedere op dieselfde manier ge-etikiteer word, daar is

fundamentele verskille tussen die twee. Veiligheid bly die belangrikste prioriteit vir beide ekolandgoedere en ekovriendelike landgoedere, gevolg deur bewaringsprioriteite.

Daar word aanbeveel dat 'n geskikte definisie geskep word wat ‘n ekolandgoedere omvattend beskryf. 'n Wetgewende raamwerk is ook nodig om nuwe ontwikkelings van hierdie aard suksesvol te kan maak. Ontwikkelaars, staatsamptenare en beplanners moet saam werk om 'n raamwerk vir die ontwikkeling van ekolandgoedere te skep. Hierdie landgoedere is 'n alternatiewe vorm van ontwikkeling, beter as konvensionele ontwikkeling, wat die vermoë het om in harmonie met die natuur te kan opereer. Hulle kan egter slegs suksesvol wees indien hulle met ware idees van volhoubare ontwikkeling in gedagte en op 'n regverdige en billike wyse ontwikkel word.

Trefwoorde: bewaringsontwikkeling, ekoheid, eko-landgoedere, eko-ontwikkeling, ekovriendelik, omheinde gemeenskap, groen geboue, groen intervensies, natuur, volhoubare ontwikkeling

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ACRONYMS AND ABBREVIATIONS

AsgiSA	Accelerated and Shared Growth Initiative for South Africa
BREEAM	building research establishment environmental assessment methodology
CO_2	carbon dioxide
CoCT	City of Cape Town
CFLs	compact fluorescent light bulbs
CIB	International Council for Research and Innovation in Building and Construction
CPTED	crime prevention through environmental design
CSIR	Council for Scientific and Industrial Research
EDGE	excellence in design for greater efficiencies
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GBCSA	Green Building Council of South Africa
GDP	gross domestic product
GHG	greenhouse gas
GIS	geographic information systems
HOA	homeowners association
HVAC	heating, ventilation and air conditioning
IUCN	International Union for Conservation of Nature
LEED	leadership in energy and environmental design
MDGs	Millennium Development Goals
MPA	marine protected area
NEMA	National Environmental Management Act
PCAs	primary conservation areas
PV	photovoltaic
SBAT	sustainable building assessment tool
SBS	sick building syndrome
SCAs	secondary conservation areas
SDGs	Sustainable Development Goals
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNEP	United Nations Environment Programme

UNFCCC	United Nations Framework Convention on Climate Change
USA	United Sates of America

CHAPTER 1 INTRODUCTION

1.1 INTRODUCTION

It is widely acknowledged that a need exists to live in harmony with nature to attain an equitable balance among the social, economic and environmental needs of present and future generations (Ikerd n.d.; United Nations 2009). However, attaining this intricate balance has become one of the greatest present-day challenges faced by the world (Adams 2009). Unsustainable consumption and production patterns have resulted in the depletion of the world's natural resources and rapid environmental degradation (United Nations 2009). This has had adverse consequences, not only for the Earth, but especially for the health and well-being of humanity.

Nature is commonly treated as a commodity mainly for the benefit of people, while environmental problems are considered solvable through technology (United Nations 2009). However, according to recent reports human well-being and nature have been found to be interdependent (United Nations 2016; Wilson et al. 2016; United Nations 2017). Therefore, a more sustainable model for production, consumption and the overall economy is required to meet the basic needs of a growing world population within the carrying capacity of the Earth (United Nations 2009).

Recently the world population stood at 7.3 billion and it is expected to reach 8.5 billion by 2030, 9.7 billion in 2050 and 11.2 billion by 2100 (United Nations 2015b). Population growth leads to increased urbanisation, spatial expansion of urban areas and thus an overall impact of human settlements on the natural environment. Housing demand, urban and rural sprawl, transportation modes and basic service infrastructure are the physical elements of human settlements that impact most noticeably on the natural environment (Department of Environmental Affairs 2016). Furthermore, considerable financial resources are required for investment in infrastructure and services (Li & Yao 2009; UN-Habitat 2016). There are unmistakable indications that the impacts of human settlements on environmental resources is increasing (Department of Environmental Affairs 2016).

This undermines the ability to achieve sustainable development (UN-Habitat 2016) which has become a global priority (Zopf 2017). However, development is not accomplishable without infrastructure and without infrastructure urbanisation is impossible (Sarma 2014). Clearly, the building and construction sector play a crucial role in the sustainability movement (Gunnell 2009; Chua 2015). Consequently it is vital to investigate alternative forms of human settlement which are in harmony with nature.

1.2 THE RESEARCH PROBLEM

Principle 15 of the Stockholm Declaration states that "[p]lanning must be applied to human settlements and urbanisation with a view to avoiding adverse effects on the environment and obtaining maximum social, economic and environmental benefits for all" (United Nations 1972: 5). This idea of preserving and enhancing the human and natural environment has filtered through Habitat I, II and III[1]. It has recently been applied and refined in the 17 sustainable development goals (SDGs) and 169 targets of the 2030 Agenda for Sustainable Development. The agenda envisions a world in which human settlements are sustainable – economically, environmentally and socially – and world environments which are inclusive, safe and resilient where people live in harmony with nature (United Nations 2015a).

In addition to the SDGs, South Africa is bound by a number of other international agreements, its constitution and numerous national laws and policy documents promoting sustainable development and enhancing its commitment to addressing climate change (Landman & Du Plessis 2007; South Africa 2016). However, the challenges of interpreting these global objectives and incorporating them in operations and projects are formidable.

Globally, housing development and residential land consumption per capita have emerged as key drivers of land-use change (Bradbury et al. 2014). In South Africa rapidly increasing population growth, coupled with urbanisation and backlogs in housing provision, have resulted in residential developments by the state and private developers in which urban planning has prioritised quantity over quality of the environment (Grey-Ross et al. 2009). Residential development accounts for a third of all development in South Africa's largest cities (Department of Environmental Affairs 2007). But this has predominantly occurred in a low-density, sprawling fashion on the urban peripheries (Rosenzweig 2000; Department of Environmental Affairs 2007). Owing to continued population growth not only South Africa's largest cities have been affected by sprawl but also the small towns and rural areas leading to rapid spatial fragmentation and expansion (Department of Environmental Affairs 2016). These are vexing problems as sprawling cities and rural settlements are often viewed as highly inefficient and unsustainable, with many environmental downsides

[1] Habitat I began in 1976 when governments began to recognize the need for sustainable human settlements and the consequences of rapid urbanisation. The purpose of Habitat II in 1996 was to address global important matters of adequate shelter for all and sustainable human settlements development in an urbanising world. Habitat II recognized that human beings are at the centre of concerns for sustainable development, and they are entitled to a healthy and productive life in harmony with nature. Habitat III arose in 2006 aimed to focus on the transformations and changes post the 20th century. Due the various changes and transformations occurring over the years, it was necessary to revisit the urban agenda and to reposition and rethink the approaches on urban policy.

(Council for Scientific and Industrial Research (CSIR) 2008; Turok 2011). These adverse environmental impacts are being exacerbated through the proliferation of a form of residential development, lifestyle estates[2] which are a type of gated community[3] in South Africa. Gated communities have become an increasingly popular feature in the South African landscape since the late 1990s for several reasons (Landman & Schönteich 2002). Key factors are personal security, financial security, resource security, socio-cultural security and lifestyle security (Landman & Du Plessis 2007). There are nearly 7000 gated communities in South Africa and some 355 000 residential properties are estate homes (Collins 2017).

Lifestyle estates have raised justified concern, because they are commonly built on the urban periphery or beyond, particularly on greenfields[4] or on valuable and productive agricultural land where natural amenities are abundant (Department of Environmental Affairs and Development Planning 2005; Spocter 2011; Landman & Badenhorst 2012; Department of Environmental Affairs 2016). These estates are generally large, sprawling developments which radically change the landscape to accommodate the needs or lifestyles of its residents (Hello House 2016). This has engendered a range of issues about the sustainability of this type of development. These involve the cost of job losses in the agricultural sector; the cost of replacing agricultural resources, the cost of service infrastructure; the cost of providing solutions to ensuing traffic and public transport problems; and the costs of the loss of town character in rural and suburban communities, biodiversity and conservation resources (Department of Environmental Affairs and Development Planning 2005; Landman & Badenhorst 2012).

Socially, these private developments cater for a specific class of individuals whose lifestyles largely oppose inclusive development as they prevent citizens from accessing various resources which were once accessible to all (Atkinson 2006; Roitman 2010; Spocter 2013). Overall, lifestyle estates located in these areas contribute to the difficulty of achieving sustainable development as they are contrary to South Africa's policy preferences for urban infill, consolidation or compaction

[2] Lifestyle estates fall within the security village category of gated communities in South Africa. The emphasis within security villages is that they are purpose-built areas by private developers with security being the uppermost requirement, although lifestyle requirements and prestige are also important (Landman 2002). Lifestyle estates are developed particularly with a niche market in mind (Spocter 2016).

[3] Gated communities in South Africa are defined as "…a physical area that is fenced or walled off from its surroundings, either prohibiting or controlling access to these areas by means of gates or booms" (Landman 2004: 5). According to Landman (2004), gated communities in South Africa can be broadly categorised as security villages and enclosed neighbourhoods.

[4] The term greenfield is used to denote land that has never had buildings on it before (*Cambridge Dictionary* 2018). Usually such land is located around cities in the countryside (*Cambridge Dictionary* 2018).

given the low density of these estates (Schäffler et al. 2013). Eco-estates present an alternative form of residential housing development in which houses are "...designed to minimise impacts of the houses built in that particular area on the surrounding environment by using materials and processes that are considered to be environmentally friendly" (Sherriff-Shüping 2015: s.p.). Attempts to balance development and conservation, to lessen the constraints of residential development in order to achieve efficient and sustainable developments has led to the emergence of eco-estates[5] as a type of 'green'[6] lifestyle estate in South Africa.

Not only do eco-estates contribute to the greening of the built environment through various design features, they also play a role in the conservation of scarce natural resources and promote greater sustainability through living in harmony with nature (Landman & Badenhorst 2012; Reed et al. 2012). Eco-estates are purposely built to be sustainable (Hello House 2016). However, their use of "…nature as an object of conquest or material exploitation has, in turn, created antithetical concerns, among them the belief in nature conservation and environmental sustainability" (Redclift 2006: 8). Property developers misuse the terms 'eco' and 'sustainable' for marketing purposes, thus engaging in greenwashing[7] to create false impressions of engaging in sustainable development (Department of Environmental Affairs 2016). Since residential development is inevitable and environmental stakes are high, analyses and investigations of developments referred to as eco-developments are required, particularly for the sake of future generations who must pursue the vision of living in harmony with nature.

1.3 RESEARCH AIM AND OBJECTIVES

The overarching aim is to establish whether lifestyle estates which are branded as eco-estates are different to those described as being 'eco-friendly' or 'environmentally conscious' in their marketing material. Five objectives are pursued in the investigation, namely:

1. Review the relevant literature review on eco-estates and eco-friendly estates.
2. Undertake a locational analysis of eco-estates and eco-friendly estates in South Africa.

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[5] Eco-estates are referred to as 'conservation communities' in Canada, Latin America and Australia. In the USA, they are referred to as 'conservation developments' (Mockrin et al. 2017).

[6] According to Terrachoice (2010: 8) "[g]reen is a difficult word. It's evocative and powerful". However it is usually referred to as "…the actions of individuals, businesses and governments to protect the quality and continuity of life through the conservation of natural resources and the prevention of pollution" (Viviers 2009: 31).

[7] Greenwashing is defined as "…the practice of making unsubstantiated or misleading claim about the environmental benefits of a product, service, technology or company practice. Greenwashing can make a company or industry appear to be more environmentally friendly than it really is" (Groenendaal 2018: s.p.).

3. Determine whether eco-estates and eco-friendly estates are located contiguously with existing conservation areas.
4. Explore the degree to which eco-estates and eco-friendly contribute to greening interventions.
5. Create a categorisation of eco-estates and eco-friendly estates.

The aim and objectives will assist in differentiating between eco-estates and eco-friendly estates, along with understanding what constitutes the 'eco-ness' of eco-estates. 'Eco-ness' is defined as the level or degree to which eco-estates adopt 'green' practices which enable a healthy habitat or environment that is in harmony with nature.

1.4 STUDY AREA

The study area for this thesis is the whole of South Africa. By choosing the whole of South Africa, a larger sample is included. Thus, the results of the study will be representative of the entire country and specifically the larger population of eco-estates. Furthermore, a country-wide study may reveal potential differences or similarities in terms of eco-estates in the nine provinces.

Source: Author

Figure 1.1 Study area: South Africa's nine provinces

The reason for choosing eco-estates as the objects of the study is that they are a rapidly emerging alternative form of housing in South Africa which could potentially serve as catalyst for change toward establishing sustainable human settlements through their goal of harnessing development to benefit both natural systems and human communities. The following section describes the methodology and methods adopted in the study.

1.5 RESEARCH METHODOLOGY AND METHODS

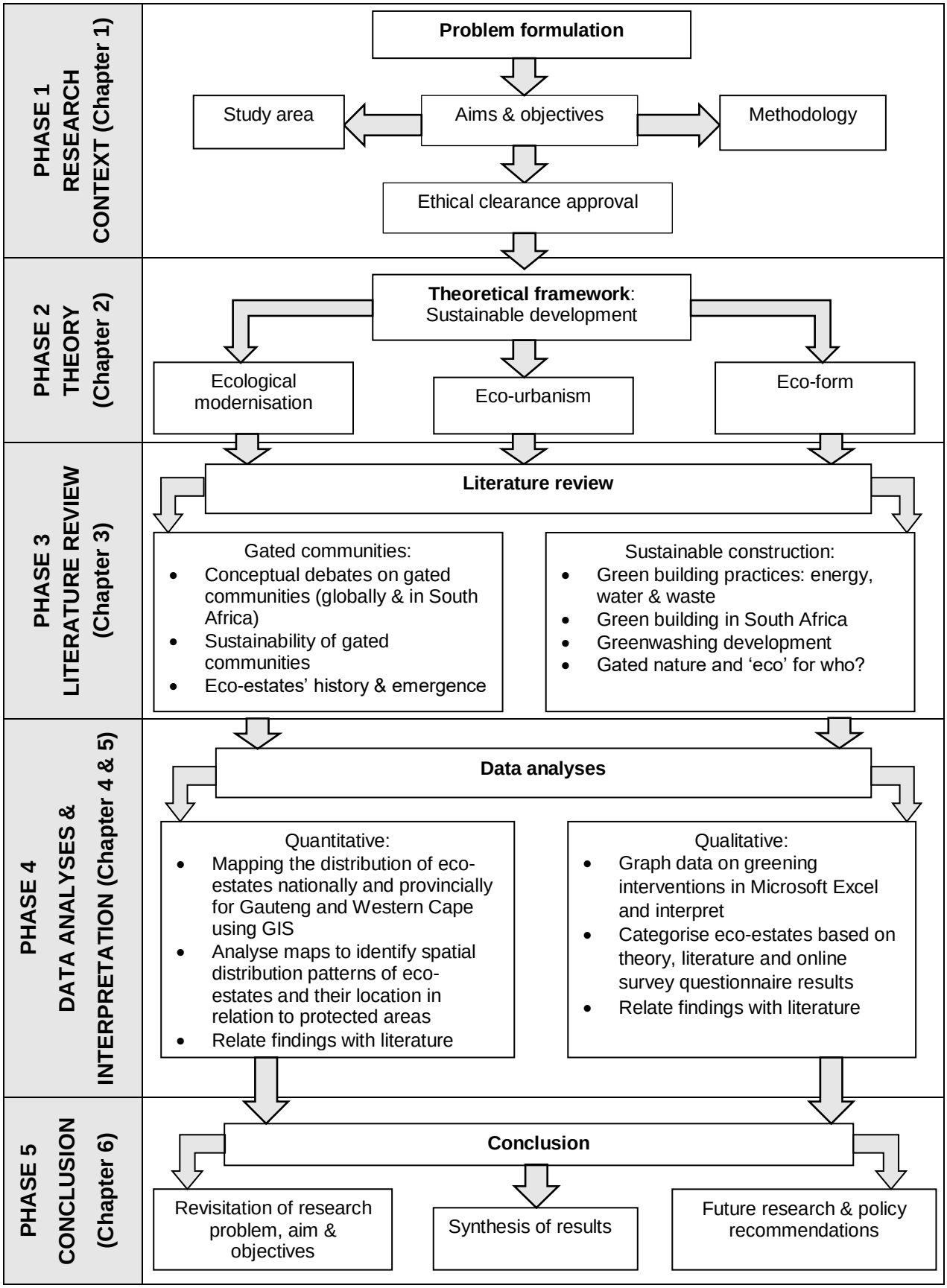
The study was conducted through five phases (see Figure 1.2). Phase 3 is specifically dedicated to the literature review. However, relevant literature on eco-estates was studied throughout the research process to better understand the research topic, and to ensure that all potential literature avenues were covered. The review guided the formulation of the research problem and led to the statement of the research aim and its objectives, which constitutes Phase 1 of the research process. This enabled the researcher to decide on the appropriate study area, methodology, methods and materials to be used throughout the research process. A research proposal was completed in order to present the ideas of the overall research topic and the proposal formed the basis of obtaining ethical approval for the study from the Research Ethics Committee for Human Research (See Appendix A for the ethical clearance approval letter.) Reviewing of the relevant literature provided the necessary background for choosing a suitable theoretical framework (phase 2) for the study namely sustainable development and its subset concepts of ecological modernisation and eco-form.

Considering the objectives of this study, an explanatory study was conducted using a mixed-method approach in phase 4. Quantitative and qualitative approaches were used simultaneously to collect and analyse the data. The use of a mixed-method approach provides a more comprehensive approach to the research, as it is not a limiting form of research. Instead it is pluralistic, inclusive and complementary (Johnson & Onwuegbuzie 2004). By adopting a mixed-method approach, the aim of understanding the differences between and eco-estates and eco-friendly estates will provide a more complete understanding rather than either approach alone.

1.5.1 Quantitative methods

The quantitative data was collected by constructing a database of all the residential estates in South Africa which have the prefix ‘eco-’ or word ‘eco-estate’ in their official name and those estates which are described or marketed as ‘eco-estates’ or ‘nature estates’ or lay claim to be conserving the environment through various ‘green’ or sustainable interventions. The former is regarded as

eco-estates and the latter is regarded as eco-friendly estates in this study.



Source: Author

Figure 1.2 Research design for investigating the 'eco-ness' of eco-estates in South Africa

Appendix B[8] shows the database with all the categories of eco-estates and eco-friendly estates found in this study. Therefore, a purposive sampling method was used to select the estates for this research.

Secondary data was mostly used to construct the database. This included Internet searches using Google searches. The keywords or marketing terms 'eco-estate', 'eco-friendly', green building', 'green living', 'sustainable estate', 'nature', 'green estate', 'green development', 'conservation development', 'energy-efficiency', 'water saving' and other alike terms were used.

Online library database searches were conducted, in particular Sabinet Media, using the keyword 'eco-estate'. This was done to also identify eco-estates and eco-friendly estates and to find additional information on disputes or other issues surrounding eco-estates. Extant South African studies of eco-estates were completed to add estate names to the database. The search for eco-estates and eco-friendly estates for the database began in February 2017 and elapsed in April 2018. Proposed (planning stages or very early stages of building) developments and established eco-estates were included in the database. The coordinates stored in the database were used to map the location of eco-estates.

1.5.2 Qualitative methods

Qualitative data collection included structured online questionnaire surveys of the managers of eco-estates and eco-friendly estates (Appendix C) and of developers of eco-estates and eco-friendly estates (Appendix D). While proposed developments were included in the database, only the established and well-developed estates were chosen for inclusion in the survey. The selected estates were checked on Google Maps and Google Earth imagery to ensure that they were well-developed and not still in their early stages of development. Google Forms were used to compile the questionnaire. The link to the online questionnaire survey was sent via email nationally to all the eco-estate developers and estate managers of all the estates contained in the database. If the estate had no website or email address, potential respondents were contacted telephonically. They were informed in the email that their anonymity would be guaranteed according to the research ethics of Stellenbosch University. Potential respondents could consider whether or not to participate, think about their responses if they made the decision to participate and then complete the questionnaire when they had time to do so. The participants were required to provide a substantial amount of information and it took approximately 20 minutes to complete the questionnaire.

[8] Appendix B also shows the estates distance to the closest protected area which will be discussed in Chapter 4.

While the online method had the added benefit of eliminating interviewer bias, it brought with it the major disadvantage of online surveys – low response rates. The challenge to improve response rates was faced in this survey. Initially a generic email was sent to all the potential respondents but it yielded a response of only three completed questionnaire surveys in a two week period. Thereafter, personalised emails were sent at different times and days of the week over a three month period yielded a return of 18 completed questionnaires.

1.5.3 Data preparation and analysis

The information contained in these 18 questionnaires was then exported to Microsoft Excel for subsequent analysis. Microsoft Excel was used to make graphs or tables to support textual questionnaire inputs, which were interpreted directly by the researcher. Geographic information systems (GIS) was used to map the eco-estates nationally and provincially, for two provinces namely Gauteng and Western Cape. GIS also enabled the eco-estates' location to be shown in relation to protected areas in South Africa. Phase five completed the research process during which the research problem, aim and objectives were revisited and synthesised with key findings to conclude the study.

1.5.4 Validity and reliability of the data

In this study validity and reliability of the collected data was enhanced by adopting some practices. Firstly, it was ensured that there was conceptual clarity regarding the research aim and objectives and their link to existing literature and theories. This enabled the data collection instrument to be designed with ease and ensured it was designed based on relevant theory, concepts and literature. Secondly a pilot study was conducted and areas of ambiguities noted and corrected before questionnaire survey links were sent via email to all the established estates in the database. Estate managers and developers were able to compete the questionnaire in their own time without any potential researcher bias.

1.5.5 Philosophical underpinnings

This study is positioned within pragmatism. Given (2008) contends that defining pragmatism is difficult due to its relevance to multiple disciplines such as deep ecology, philosophy and humanistic psychology and due to its emergent nature. Central to pragmatism is the notion that truth is found in 'what works' and that it is relative to the current situation. It acknowledges that truth is subject to change. "Truth changes over time because reality changes, and truth changes through space because people have differing ideas" (Given 2008: 6). Pragmatism is sometimes defined by splitting the philosophical and practical aspects, Given (2008: 6) provides the following definition:

> Pragmatism. An American philosophical movement consisting of varying but associated theories marked by the doctrine that practical consequences are the central criteria of knowledge. Pragmatism is seen as the function of reflective thought and relationships to guide action and that truth is relative to the practical consequences of any belief (Given 2008: 6).

It is a philosophy that is based on whether or not theory can be put into practice. In this study it is whether or not notions, ideas and concepts born from the underlying theory of sustainable development is able to be put into practice through eco-estates.

1.6 THESIS STRUCTURE

Chapter 1 provided the context and background for the study, which culminated in the formation of to the problem statement, the aim and objectives. The study area was also introduced here. The research methodology and methods were also discussed, along with a supportive illustration of the research design.

Chapter 2 encompasses the study's theoretical framework. The concepts and theories sustainable development, ecological modernisation, eco-form and eco-urbanism are discussed. Sustainable development is the golden thread running through the study. Concepts and theories which have emanated from sustainable development are examined on how they have contributed and shaped what is now known as eco-estates in South Africa. Chapter 3 constitutes a review of the literature deemed relevant to this study. It captures the phenomenon of eco-estates within the broader topic of gated communities and discusses related themes or ideas like conservation development, green building practices, greenwashing and the commodification of nature.

Chapter 4 begins with the analytical component of this study by examining the national picture of eco-estates in South Africa. Their location is discussed in relation to a number of elements and thereafter emphasis is placed on their location in relation to protected areas. The promotional descriptions of the eco-estates and eco-friendly estates who responded to the questionnaire is provided and an analysis of these particular estates regarding their location is reported.

Chapter 5 continues the analysis investigating the motivations of property developers in South Africa to move towards developing eco-estates. The various green building interventions being practised in eco-estates and eco-friendly estates in South Africa are discussed. Attention is given to energy efficiency, water efficiency and waste reduction practices. The chapter then considers the underlying question of what an eco-estate is and what constitutes 'eco-ness' in such developments. Chapter 5 concludes by speculating on the way forward for eco-estates from the perspective of eco-estate developers and estate managers.

Chapter 6 commences by revisiting the study aim and objectives. The study's main findings are summarised. Some limitations are named and recommendations for policy and future research are made. Brief closing remarks conclude the chapter. The thesis now turns to the theoretical framework.

CHAPTER 2 THEORETICAL FRAMEWORK

2.1 INTRODUCTION

This chapter sets out the theoretical underpinnings of the study with emphasis on sustainable development and ecological modernisation, the theories which lay the foundation for the rise of eco-estates. Definitions are given and related critiques are discussed. Thereafter, the chapter turns to the concept of eco-form which has emerged as an element of sustainable development and represents the desired spatial form of human habitats. These concepts and the overarching theories have informed urban planning theories, one notably being eco-urbanism, which is defined and explored.

2.2 SUSTAINABLE DEVELOPMENT

Central to environmental politics is the tension between economic growth and environmental protection (Carter 2007). Sustainable development attempts to resolve this division by communicating that economic development and environmental protection can exist together. To achieve this, sustainability requires harmony between the environment and present and future generations (Ikerd n.d.). According to Carter (2007) sustainable development, along with its so-called "half-sister" ecological modernisation provide an alternative policy paradigm to the traditional model of environmental policy.

The idea of sustainability can be traced back to more than 30 years to the new mandate adopted by the International Union for Conservation of Nature (IUCN) in 1969 (Adams 2006). Subsequently, sustainability became a crucial subject of the United Nations Conference on the Human Environment in Stockholm in 1972 at which the conflicts between environment and development were first acknowledged (McCormick 1992). Thereafter, in 1980, the World Conservation Strategy of the IUCN advocated for conservation as a way to assist development and, particularly for the sustainable development and utilisation of species, ecosystems and resources (Adams 1990). Building on these ideas the Brundtland Report in 1987, (otherwise known as 'Our Common Future'), sought to unite environment and development. The term sustainable development was coined explicitly to suggest that economic growth and industrialisation could be established without damaging the environment. The Brundtland Report argued that:

> The environment does not exist as a sphere separate from human actions, ambitions, and needs, and attempts to defend it in isolation from human concerns have given the very word "environment" a connotation of naivety in some political circles. The word "development" has also been narrowed by some into a very limited focus, along the lines of "what poor nations should do to become richer", and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of

> "development assistance". But the "environment" is where we live; and "development" is what we all do in attempting to improve our lot within that abode. The two are inseparable. (World Commission on Environment and Development (WCED) 1987: s.p.).

In the decades which followed conventional sustainable development thinking was evolved through major international meetings. The United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992 issued a declaration of principles, a detailed Agenda 21 of desired actions, international agreements on climate change and biodiversity, and a statement of principles on forests (Parson, Haas & Levy 1992; UNCED 1997). In addition, three conventions were adopted at this summit known as 'Rio Conventions'. These are the United Nations Framework Convention on Climate Change (UNFCCC), the UN Convention on Biodiversity and the Convention to Combat Desertification.

In 2002, the World Summit on Sustainable Development reaffirmed the commitment to sustainable development and full implementation of Agenda 21, alongside the Millennium Development Goals (MDGs) and other international agreements. In 2012 an agreement to launch a set of universal Sustainable Development Goals (SDGs) emerged from the United Nations Conference on Sustainable Development (Rio+20). In September 2015, 17 goals and 169 targets were adopted (United Nations 2017). The goals build on the MDGs and include and transcend Agenda 21 and the Johannesburg Plan of Implementation. However, while the MDGs were aimed at the global South, the SDGs have a more universal outlook and aim to promote financing beyond 'development aid', with multi-stakeholder partnerships, social investment and ethical trade (East & White 2016). The SDGs attend to intricate and interlinked social and environmental challenges while maintaining a holistic outlook of development and sustainability. In addition, the goals form the basis of the 2030 Agenda for Sustainable Development.

Aside from being a concept, sustainable development has emerged as a goal and as a campaign that has filtered rapidly among government planning and wider participation by various business leaders and non-governmental organisations (NGOs) and places (Kates et al. 2005; Adams 2006). Therefore, over the decades the definition of sustainable development has evolved and will inevitably continue to evolve.

2.2.1 Defining sustainable development

Sustainable development is a difficult, fluid and elusive concept to define. Parkin (2000), drew attention to the more than 200 definitions of the concept and further made the point using examples from the United Kingdom, that if defining the concept it is difficult, putting it into practice is even more so. He further stressed that sustainable development is merely the journey towards achieving the overall goal of 'sustainability'. Fowke & Prasad (1996) who analysed sustainable development

particularly in relation to cities and urban local government, identified about 80 different, competing and sometimes contradictory definitions.

The definition of sustainable development most commonly cited occurs in the Brundtland Report where sustainable development is defined as "[d]evelopment that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987: s.p.). The IUCN modified this definition and together with the Brundtland Report definition became an oft-quoted definition, namely to "…improve the quality of life while living within the carrying capacity of ecosystems" (IUCN 1991: 10). Regarding development, the Brundtland Report proclaimed that human needs are basic and essential. Economic growth and resources should be shared equally with the poor to sustain them and finally, effective citizen participation encourages equity. Concerning the environment, the report states that:

> The concept of sustainable development does imply limits – not absolute limits but limitations imposed by the present state of technology and social organization on environmental resources and by the ability of the biosphere to absorb the effects of human activities. (WCED 1987: s.p.).

Therefore, the Brundtland Report's definition contains within it the concept of needs, particularly the crucial necessities of the world's poor both in the North and South, must be given utmost priority. Poverty and the unequal distribution of resources are perceived as a result of environmental degradation (Carter 2007). The report emphasises that to ensure this is an achievable goal, consumption patterns in the richer countries need to be readjusted.

The idea of limitations is also found in the Brundtland Report's definition. Limitations imposed by the state of technology and social organisation on the environment's ability to meet present and future needs. This strongly suggests that demands on the natural environment should be moderated (Carter 2007). Thus, as Gupta (2017) and Chiu (2004) argue the core of sustainable development is how the needs of the present generation are balanced without threatening the needs of future generations environmentally, economically and socially. While the Brundtland Report clearly states its goals and ideas, its definition of sustainable development creates a paradox. Therefore, as Gupta (2017) and Redclift (2005) contend – the question arises whether sustainable development is an attainable goal or simply an oxymoron.[9]

2.2.2 Sustainable development's paradoxical nature

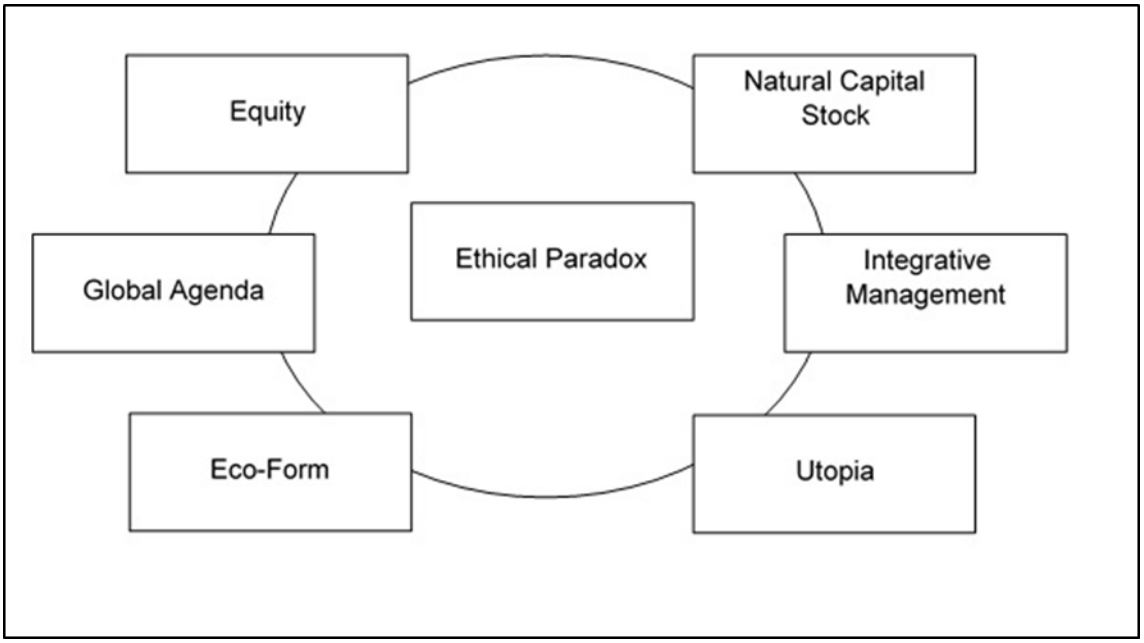
Williams & Millington (2004) have studied the diverse and contested meanings of sustainable development. They submit that it is necessary to first recognise this paradox as it is the starting

[9] An oxymoron is defined as "…a figure of speech combining contradictory words" (*English Dictionary* 1999: 307).

point for comprehending much of the sustainability literature and the concept's various meanings. The authors refer to the paradox as the 'environmental paradox' which they define as "…a mismatch between what is demanded by the Earth and what the Earth is capable of supplying" (Williams & Millington 2004: 100). Those supporting this view contend that societal demands on the Earth should be reduced and/or resources should be increased so that the gap between the supply and demand can be bridged to some extent (Williams & Millington 2004). It is this process of gradually conjoining demands on and the supply of resources – the finite and infinite aspects of human life that defines the sustainable development process.

Fey & Lam (n.d.) also refer to the paradox of sustainable development but they refer to it as the Ecocosm Paradox which is the set of dilemmas arising from the compound hyper-exponential annual growth of world human consumption of resources. The Ecocosm Paradox has two main characteristics, namely if human consumption growth continues the planetary life support system will be disabled and the very existence of humanity will be endangered; and in contradiction, if the consumption growth is stopped the viability of the global economic and financial system will be threatened so endangering the stability of governments, social systems and individuals (Fey & Lam n.d.).

The paradoxical nature of 'sustainable' and 'development' has been referred to by Jabareen (2008) as the 'ethical paradox' which is one of seven key interwoven concepts he synthesised and assembled as a theoretical framework of sustainable development. Figure 2.1 illustrates the framework. The ethical paradox lies in the centre of the framework. Originating from the field of ecology, the term sustainability is defined as "an ecosystem's potential for subsisting over time, with almost no alteration" (Jabareen 2008: 181). This explanation of the paradox is perhaps the closest to that expressed in the Brundtland Report's definition of sustainable development.



Source: Jabareen (2008: 188)

Figure 2.1 A conceptual framework for sustainable development

According to Carter (2007), sustainable development has allured many followers because it promises a way out of the ecological (sustainability) versus economic (development) impasse. Baeten (2000) argued earlier that when brought together under the banner of sustainable development, capitalism and ecology are no longer contradictory. Sustainable development enables the 'limits to growth' to become manageable and negotiable.

2.2.3 The complex nature of defining sustainable development

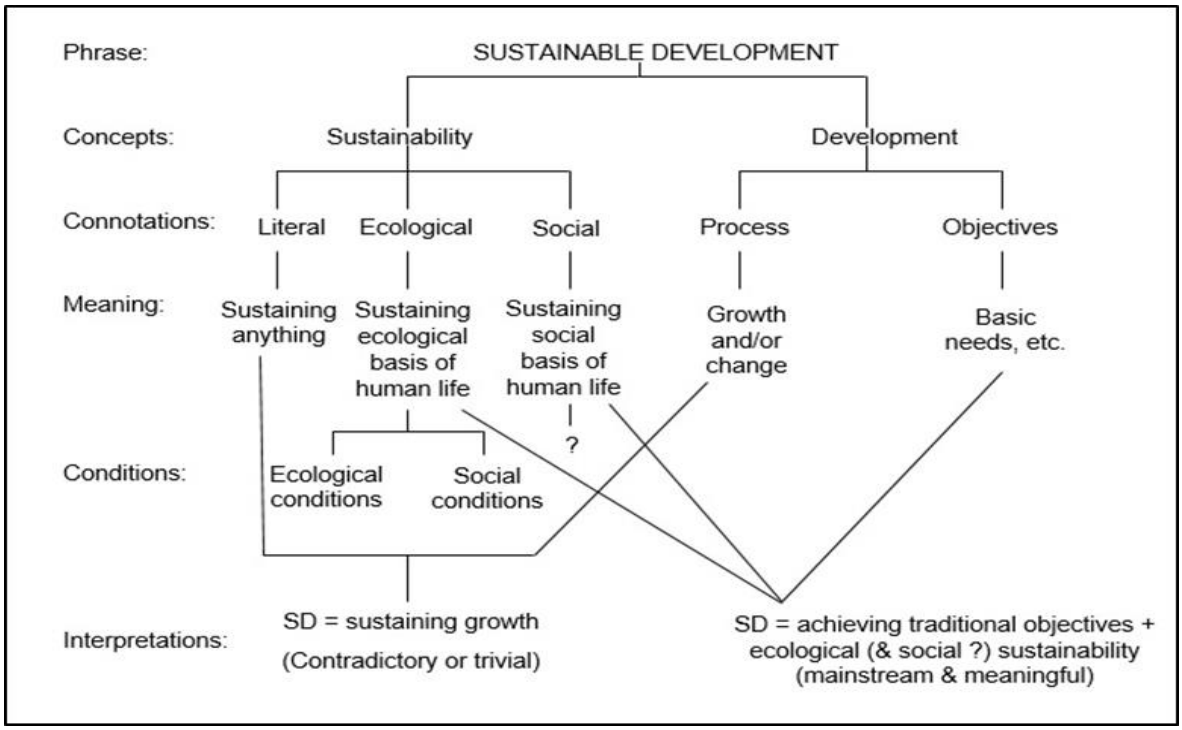
This flexible, paradoxical and argumentative relationships between sustainability and development have given rise to a series of beliefs and perspectives ranging from 'light ecology' to 'deep ecology' (Jabareen 2008) or even 'weak sustainability'[10] to 'strong sustainability'[11] (Williams & Millington 2004; Jenkins & Bauman 2010). These two approaches loosely correspond to ecocentric (ecological-centred) and anthropocentric (human-centred) positions in environmental ethics, but not perfectly (Jenkins & Bauman 2010). A third approach has been rooted by some

[10] "Weak sustainability disregards specific obligations to sustain any particular good, espousing only a general principle to leave future generations no worse than we are" (Jenkins & Bauman 2010: 382).

[11] "Strong sustainability gives priority to the preservation of ecological goods, like the existence of species or the functioning of particular ecosystems" (Jenkins & Bauman 2010: 382).

scholars, namely 'a pragmatic middle view'[12] (Jenkins & Bauman 2010). This approach proposes that conditions should be sustained for the ongoing debate over sustainability. However, this view has been criticised from two angles: on one hand it is too humanistic and, on the other hand, it is insufficiently humanistic (Jenkins & Bauman 2010).

These approaches, along with attempts to ensure that sustainability and development can go hand in hand and the manner in which they are used and interpreted, have resulted in diverse, complex and contested meanings of sustainable development. Therefore, Brundtland Report's definition of sustainable development has been criticised as vague, ambiguous and easily open to misinterpretation (Pesqueux 2009). Earlier however, Lélé (1991) had critically reviewed sustainable development literature and concluded that to some extent the value of the phrase lay in its broad vagueness because it enabled scholars holding hitherto irreconcilable positions in the environment-development debate to search for common ground, without compromising their positions. Similarly, Kates et al. (2005) asserted that the many definitional attempts form part of a continuous conversation and that sustainable development actually draws its power, resonance and creativity from its ambiguity. Figure 2.2 diagrammatically illustrates the complexity of the concept of sustainable development as summarised by Lélé (1991).



Source: Lélé (1991: 608)

Figure 2.2 The semantics of sustainable development

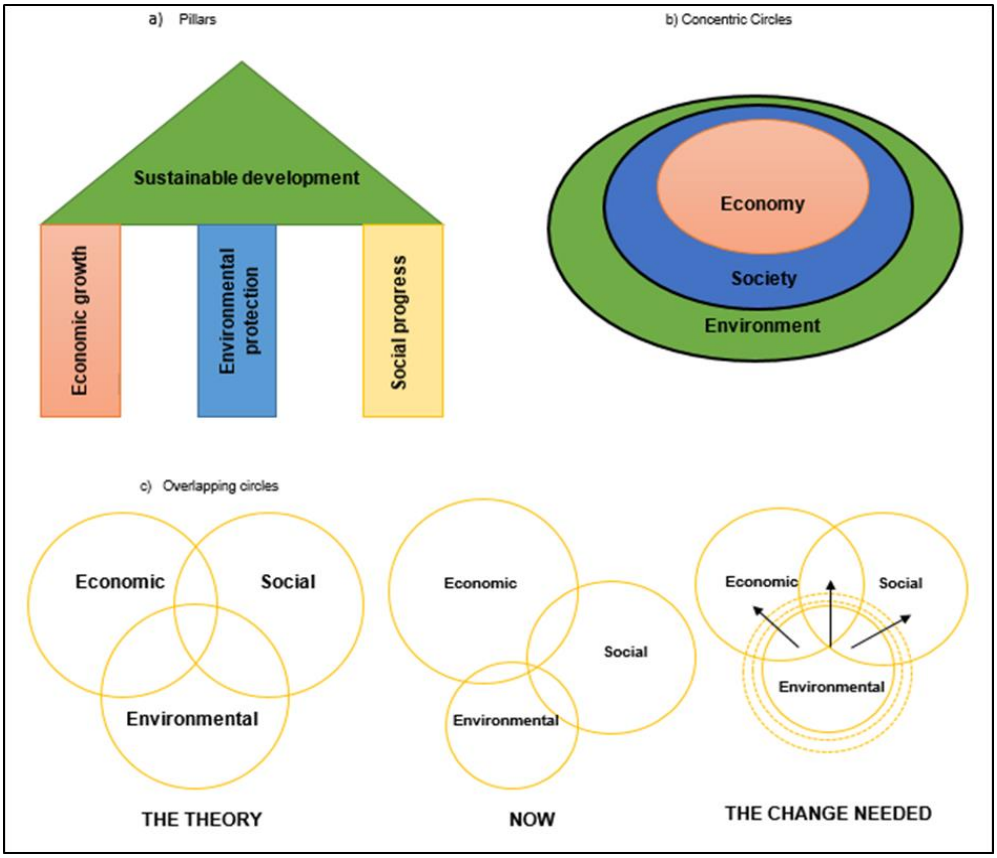
[12] This view holds that "while we may not have obligations to sustain any particular nonhuman form of life or ecological process (the strong view), neither should we assume that all future opportunities can be measured against one another (weak view)". (Jenkins & Bauman 2010: 382).

He also declared that the interpretational problems have some semantic roots. First, sustainable development is regarded as a way of sustaining growth. Lélé (1991) contends that this is a vague and sometimes insignificant interpretation. Second, a universally accepted definition is that sustainable development enables conventional objectives to be achieved along with ecological sustainability (Lélé 1991). Figure 2.2 also stresses the difficulty in defining the term since there are several associations with sustainable development. These various associations lead to many interpretations which may come across as unclear or insignificant. The schematic representation also illustrates the literal definition for sustainability: "…development that can be continued – either indefinitely or for the implicit time period of concern" (Lélé 1991: 609). There are a range of ways in which sustainable development can be defined. Kates et al. (2005) and Redclift (2005) all agree that sustainable development is sometimes defined by what it specifically seeks to achieve or what is to be sustained.

Other ways of defining sustainable development is to look at how it is measured, through the principles which promote sustainable development, and also by looking at how it is defined in practice (Kates et al. 2005). Practice includes the various efforts aimed at defining the concepts, establishing goals, creating indicators and asserting values. It is evident that sustainable development, its definitions and theories are too complex to organise around dualistic terms like 'strong' and 'weak' or 'ecocentric' and 'anthropocentric'. Therefore, in 2002 the World Summit on Sustainable Development expanded the Brundtland Report's standard definition of sustainable (Kates et al. 2005). This new definition involved the widely used three pillars of sustainable development; that is economic, social and environmental. The next subsection considers these.

2.2.4 Models of sustainable development

The Johannesburg Declaration created "…a collective responsibility to advance and strengthen the interdependent and mutually reinforcing pillars of sustainable development – economic development, social development and environmental protection – at local, national, regional and global levels" (United Nations 2002: s.p.). By expanding the definition, the World Summit addressed the continuous concern over the limits imposed by the framework where development was widely perceived as economic development (Kates et al. 2005). Giddings et al. (2002) and Kates et al. (2005) have argued that under the common tent of sustainable development the consideration for human development, equity and social justice have been obscured, so leading to environmental and economic priorities. These three dimensions have become the core of mainstream sustainability thinking (Adams 2006). However, there is no universal agreement regarding their details. Therefore, the three dimensions have been drawn in a variety of ways, as pillars, as concentric circles or as interlocking circles as presented in Figure 2.3.



Source: Adams (2006: 2)

Figure 2.3 Visual representations of sustainable development as (a) pillars, (b) concentric circles and (c) overlapping circles

At the core of sustainable development is the need to consider the three dimensions together; namely society, the economy and the environment. No matter the context, the basic idea remains the same – people, habitats and economic systems are interrelated (Strange & Bayley 2008). When environmental, social and economic objectives are achieved, it is considered that sustainable development exists. Trade-offs are required between the three pillars if a balance cannot be entirely achieved (Dalal-Clayton & Sadler 2014). The following three subsections explain the environmental, social and economic dimensions in turn.

2.2.4.1 Environmental sustainability

Environmental or ecological sustainability involves maintaining the Earth's life support system (Allen & Ervin 2007). It requires stability and maintenance of natural capital as a source of economic inputs where over-exploitation of renewable resources or environmental sink functions[13] is avoided (Harris 2000). It emphasises careful use of depleting non-renewable resources. It is

[13] "The capacity of the environment to absorb the unwanted by-products of production and consumption; exhaust gases from combustion or chemical processing, water used to clean products or people, discarded packaging and goods no longer wanted" (OECD 2005: s.p.).

required that investment be made in adequate substitutes for these types of resources (Harris 2000). Waste should be recovered and scarce resources reused (Kahn 1995). According to Environmental Defenders Office (2010) ecological sustainability is the balance that integrates the other dimensions. Ecological sustainability should create a balance where environmental considerations should not be neglected in favour of short-term economic objectives (Haines-Young 2000).

2.2.4.2 Social sustainability

As Blaikie (1995) contends, environmental issues are social issues. Therefore, it is imperative to look at them from an extended interdisciplinary approach compared to treating it as an independent issue. Social sustainability aims to attain distributional equity, provision of social services, empowerment, participation, institutional and political accountability and participation (Basiago 1999; Harris 2000). It involves maintaining community (civic) capacity which fosters effective participation and equitable treatment of all stakeholders (Allen & Ervin 2007). Furthermore, social sustainability aims to sustain the environment through economic growth and the alleviation of poverty. Some have suggested that poor countries must accept environmental degradation as a short-term consequence of economic development. Others have maintained that an enabling environment that optimises resource allocation can obviate the need for such a trade-off (Kahn 1995). However, according to McKenzie (2004) social sustainability is difficult to quantify and is consequently disregarded.

2.2.4.3 Economic sustainability

Economic sustainability refers to a system of production which supplies present consumption levels without compromising the needs of posterity (Allen & Ervin 2007). The sustainability that economic sustainability seeks is the sustainability of the economic system itself (Basiago 1999). It should aim to achieve this by restraining resource use to ensure the sustainability of natural capital, however never at the expense of environmental sustainability (Basiago 1999). The belief that economic growth will ‘trickle down’ to the poor is one of the distinct features of economic sustainability. A preferred scenario is where economic growth and consumption which depletes natural, social and human capital is limited (Kahn 1995).

These three dimensions of sustainability add many potential complications to the original definition of sustainable development (Harris 2000). The goals expressed within each dimension are multidimensional, so raising the questions of how to adequately balance objectives and how to judge success or failure (Harris 2000). A lack of balance implies failure. However, Norgaard (2006) claims that in reality trade-offs are rarely avoided and only one objective can be maximised at a time.

The normative nature of sustainable development and its unique standard approach to development, makes it complex to apply (Harris 2000; Norgaard 2006). However, at the same time, Harris (2000) has averred that the concepts considered here do agree with common sense. The dilemma of developing sustainably is simply that if achievable "…the world would be a better place" (Harris 2000: 6). But in reality sustainability is difficult to achieve owing to the intricacy of balancing the three pillars equally (Harris 2000). Harris (2000) has contended that recognising sustainability is a difficult task compared to identifying unsustainability. Identifying unsustainability drives policy formulation which may rectify it.

Despite sustainable development's vagueness and transparency to interpretation, the concept has developed fundamental guidance and values stemming from its original definition (Kates et al. 2005). These are related particularly to meeting needs now and in the future for human, economic and social development within the means of the life support systems of the planet. Moreover, the connotations associated with sustainable and development, are generally perceived to be positive, and their combination permeates an almost universal accordance that it is a beneficial goal (Kates et al. 2005). Sustainable development's evolved nature has expanded to fit human and social development and alternative views of nature (anthropocentric versus ecocentric) (Kates et al. 2005). Therefore, the concept maintains an openness to different viewpoints and adaption to various social and ecological contexts. This would explain the rise of ecological modernisation which will be discussed in the next section.

2.3 ECOLOGICAL MODERNISATION

The implementation of sustainable development in a capitalist country will certainly be difficult to make real progress if it does not appeal to the economic interests of the business sector (Carter 2007). Moreover, the progression of environmental protection in certain countries may also be hampered by the centrality of North–South issues and the development agenda of the sustainable development discourse (Carter 2007). Consequently, the concept of ecological modernisation has emerged as an alternative approach to greening capitalism or as a variation of sustainable development. Hajer (1995) and Harvey (1996) have both linked ecological modernisation to sustainable development, where the latter is the 'central story line' of the discourse of ecological modernisation. However, compared to sustainable development, ecological modernisation has much more rigour and a sharper focus on the requirements of the capitalist political economy (Dryzek 1997).

The concept of ecological modernisation was originated in the early 1980s through the work of the German social scientists Joseph Huber and Martin Janicke to provide a formula for the

interplay of ecology and economy (Janicke 2007). According to Janicke (2007) and Redclift (2005) for over 20 years the concept has been used to describe a new, cleaner technology-based approach to environmental policy which is conducive to sustainable practices and which contains a win-win situation. This win-win situation refers to the stimulation of economic growth without increasing pollution, that is a situation in which each party benefits in some way. Ecological modernisation can achieve environmental improvements if understood as systematic eco-innovation (Janicke 2007).

Ecological modernisation focuses on the development of cleaner technologies and the implementation of a market for green goods and services. Ecological modernisation is said to have commonalities with the 'strong' versions of sustainability in that it envisions a "process of the progressive modernisation of the institutions of modern society, as opposed to their destruction or dismantlement" (Gibbs 1998: 4). It turns into an alternative of sustainable development which focuses on the role of business (Carter 2007). According to the idea of ecological modernisation, structural change must occur at macro-economic level through broad sectoral shifts in the economy and at micro-economic level through the use of new and clean technologies by individual firms (Gouldson & Murphey 1997). It also implies that by mixing regulations and market-based instruments to correct market failure, ecological modernisation will lead to both economic growth and environmental protection (Dryzek 2005).

When viewed as an ideology and a policy response, ecological modernisation enables governmental intervention through stronger regulation to ensure environmental protection while leaving the functioning of a capitalist market economy untouched (Wright & Kurian 2009). Policy measures and principles such as 'polluter pays', mandatory environmental impact assessment (EIA), the precautionary principle and the principle of the scientific burden of proof are central to ecological modernisation (O'Riordan et al. 2001). Such policy responses are ways of internalising or preventing environmental costs and ensuring ongoing economic competitiveness in a global economy. In short, by protecting the environment businesses can have a financial advantage, therefore ecological criteria should be incorporated into the production process (Carter 2007).

While environmental regulation may seem to restrict innovation, it has actually become a significant instrument for competition and economic modernisation (Janicke 2007). Competition for innovation merged with market potential to attain environmental advancements and the market logic of modernisation have all been claimed to be drivers of ecological modernisation (Janicke 2007). Janicke (2007) has added that marketable technological solutions for environmental problems offer a broad spectrum of win-win solutions, smart environmental regulation

(competitive advantage) and pressure on businesses to reduce pollution, thereby exerting pressure for eco-innovation.

Ecological modernisation has much to offer. A country which seizes the opportunities it has to offer – such as niche markets, new progressive products – will thrive regarding employment, affluence and a superior environment (Carter 2007). Moreover, by omitting the development agenda of sustainable development – inequalities, social justice and democracy – ecological modernisation is cheaper and less controversial. Furthermore, while sustainable development fails to provide a blueprint for action, ecological modernisation offers a set of principles and techniques to deal with problems experienced in developed countries. Moreover, as Carter (2007) contends, ecological modernisation differs in the sense that it explicitly deals with the business sector, whose contribution is critical to move to a sustainable society. Ecological modernisation responds to environmental issues through notions of profitable enterprise. Gibbs (1998), asserts that this is achieved through five forms. First, through reduced pollution and waste production which results in business efficiency. Second, by the avoidance of future financial liabilities. Third, creating a better environment equates to benefits. Fourth, it materialises through the sale of environmentally friendly products and services; and fifth through the sale of pollution prevention and abatement technologies (Dryzek 1997).

Notwithstanding its beneficial features, ecological modernisation does encounter limits where technological solutions are not available (Janicke 2008). Persistent problems of environmental policy, including urban sprawl, soil erosion, loss of biodiversity, final storage of nuclear waste or global climate change all exemplify these limits. Furthermore, incremental increases in environmental efficiency cannot always be considered as sustained solutions, as they tend to be easily wiped out (Janicke 2008). Janicke (2008) contends that structural solutions are required, where an ‘ecological structural policy’ is developed that forces non-technical solutions.

Sweden, for example, made the shift to ecological modernisation in the mid-1990’s due to increasing pressure on the Swedish economy from second-generation problems such as climate change, ecological sustainability and the Swedish budget deficit at the time (Lidskog & Elander 2012). By shifting to ecological modernisation the country adopted the understanding that economic growth and environmental policy will not contradict each other. However, even though Sweden is commonly known as one of the most ecologically-modernised countries in the world, reconciling social, economic and environmental dimensions is easier said than done (Lidskog & Elander 2012). It is assumed that by adopting ecological modernisation within environmental policy, the country would give equal attention to economic, social and environmental issues.

However, when the country experienced a financial crises and economic recession, environmental and social sustainability no longer appeared very important (Lidskog & Elander 2012). Therefore, Lidskog & Elander (2012: 422) argued that even in a country like Sweden "the gap between what has been done what must be done to approach environmental problems and sustainability is widening instead of closing…". Economic growth in Sweden continues to result in increased environmental emissions and Sweden also reveals negative trends such as the growing gap between the rich and poor and increasing amounts of children living in poverty (Lidskog & Elander 2012).

While ecological modernisation uses techniques such as life cycle assessment, issues of equity and social justice are not addressed (Carter 2007). Ecological modernisation presumes that consumption patterns do not need to be altered, particularly in the North, because production processes are being 'greened'. This may spur on increased consumption which is guilt-free and ignores the limits of growth (Carter 2007).

On another tack Janicke (2008) has argued, that ecological modernisation is insufficient to guarantee stability of the environment over time. He attributes this failure to ecological modernisation being unable to provide a way out for the various types of environmental problems, but also to a double 'hare and hedgehog-dilemma'. From one point of view, ecological modernisation, as mentioned before faces incremental environmental efficiency and economic growth and, on the other hand, ecological modernisation meets the resistance of 'ecological losers'. By this Janicke (2008) means that if industries along with private homes save energy, reduce their use of raw materials and use environmentally friendly substitutes, it will all lead to a loss in profits in the respective industrial sectors such as mining and power generation.

However, these established industries which are usually of power and influence – simply find new uses for their products and services. Consequently, ecological modernisation becomes hindered by the non-existence of actual restructuring and avoidance from the modernisation losers. This may especially relate to the notion of intragenerational equity which is promoted by sustainable development. Intragenerational equity is defined as a "…fairness in the allocation of resources between competing interests at the present time" (Jabareen 2008: 184). Regarding this definition, Boyce (1994) contended that environmental quality can be enhanced through more equitable distribution of power. Boyce (1994) refers to power as political rights, a literacy variable, an income inequality index and civil liberties along with other elements. Boyce et al. (1999) writing on power distribution with regards to the environment and public health also support the hypothesis that greater power inequality leads to greater environmental degradation.

Hence, disparities of power not only affect the distribution of net costs and benefits of environmentally degrading activities, but also the overall impact of environmental degradation (Jabareen 2008). Again, this brings to the fore the question whether ecological modernisation achieves what it seeks by emphasising the development of cleaner technologies and the need to implement of a market for green goods and services.

2.4 THE CONCEPT OF ECO-FORM

Along with ecological modernisation, sustainable development is also open to the market for green goods and services. Therefore, a key branch of sustainability strategies has concentrated on ecological design and on defining urban forms which allow the built environment and buildings to function in more sustainable ways than at present (Jabareen 2008). Since the early 20th century, various theories and models have been developed to address the ideal or desired urban form (Sharifi 2016; Jabareen 2008). The concept of 'eco-form' is used to describe "the ecologically desired form and design of the human habitat such as urban spaces, buildings and houses" (Jabareen 2008: 184). Eco-form is part of the seven key interwoven concepts introduced earlier in the conceptual framework for sustainable development recall Figure 2.1. This concept represents the desired spatial form of human habitats; that is cities, villages and neighbourhood.

The rise of sustainable development in the 1980s also contributed to the proliferation of theoretical works related to ecological design (Jabareen 2008). These approaches or theories have used technologies and ideas emanating from ecology and sustainability, such as alternative building materials, renewable energy, organic foods, conservation and recycling (Jabareen 2008). Eco-forms are created using sustainable design measures which are designed to be energy efficient and long lasting (Jabareen 2008). According to Jabareen (2008) a predominant view among many stakeholders is that energy efficiency through design at the building, community, city and regional levels is key to attaining ecological form. It is assumed that better design enhances the environment, reduces environmental degradation and increases energy efficiency.

Jabareen (2008) maintained that the common principles of the concept eco-form can be explained using the 'time-space-energy compression' concept. This time-space-energy compression, according to Jabareen (2008), requires reductions in time and space to reduce energy usage. The concept of time-space compression was developed by the Marxist geographer David Harvey in 1989 to describe contemporary developments in capitalism which resulted in the speeding up of social life in general while simultaneously reducing the significance of place (Kivisto 2012). Harvey's concept was rooted in Marx's claim that capitalism leads to the annihilation of space and time and also in Heidegger's suspicion about the implications of the shrinking of both time and

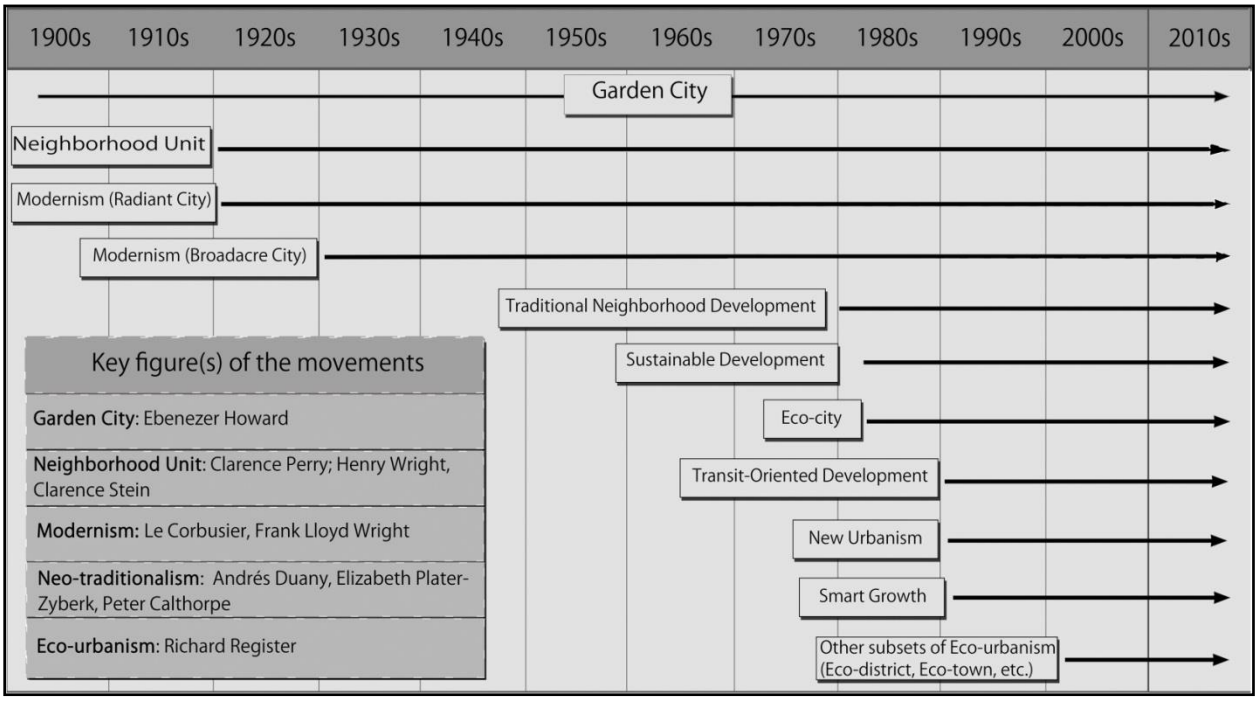
space (Kivisto 2012). Harvey (1996) reassured that capital moves at a pace faster than ever before as the production, circulation and exchange of capital happens at ever-increasing speeds, particularly with the help of advanced communication and transportation technologies.

According to Harvey globalisation is driven by the compression of social time–space through economic activity (Kivisto 2012). Aiding the mobility of capital are developments which have resulted in improved transportation systems and a revolution in technological innovations. Technological innovations, along with improved transportation systems have condensed spatial and temporal distances. Their culmination Harvey (1996) contends have undermined the monopoly of power inherent in place.

Massey (1994) supported this idea about time-space compression in her discussion of the relationship between space, place and gender. She contended that capital was going through a new phase of internationalisation, so leading to new markets. Furthermore, the specificity of place is continually reproduced, but it is not a specificity resulting from some long, internalised history. Rather, it is an accumulation of history which is owed to a number of sources. Social, cultural, economic and political relations are stretched out over the planet at different levels creating a constellation meeting and weaving together at a particular locus (Massey 1994). Experiences and understanding from each of these relations are constructed on a far larger scale that what humans define places to be a particular moment. Other related theories have evolved over time and led to new ideas and concepts, one being eco-urbanism.

2.5 THE THEORY OF ECO-URBANISM

The emergence of the concept of eco-form, along with the overarching idea of sustainable development and the importance it places on the local level has prompted several urban planning theories in attempts to integrate sustainability principles into human settlement planning. Figure 2.4 illustrates how the urban planning theories have evolved. Ebenezer Howard's Garden City was one of the earliest planning or design movements which led to environmentally-friendly neighbourhoods and sustainable neighbourhood initiatives (Jabareen 2008; Sharifi 2016). His ideas have retained a continuing attraction and to a certain extent, the suitability of his proposals is greater for current planning than it was about a century ago. Garden city notions can be found in various other movements that originated after Howard's Garden Cities, including eco-urbanism models.



Source: Sharifi (2016: 3)

Figure 2.4 The evolving nature of planning theories

The Garden City movement emerged as a response to industrial cities and towns being predominantly characterised by murky skies and slums (Howard 1902). While urban living had many downsides, the 'town' still housed the best employment and social interaction opportunities (Howard 1902). The 'countryside' on the other hand, comprised of the beauty of nature and fresh air however, with limited employment and social interaction opportunities. Based on these premises, Howard (1902: 46) proposed a third category, termed "town-country". The 'town-country' essentially constituted the benefits of both the 'town' and 'country', such as the natural scenery, no smoke, no slums, bright homes and gardens, social interaction opportunities and easy access. These garden city notions also place importance on public facilities, with an added emphasis on greenbelt recreational spaces which separates the urban centre and the surrounding countryside.

Figure 2.4 highlights how urban planning theories have kept the idea of sustainable development regarding urban form since the Garden City movement. Howard Ebenezer's Garden City has essentially provided the foundation for 'green' urban forms and today, his idea of bringing nature back into the city is a major priority. Therefore, over the years urban form has been enhanced with environmental rationalisation and further precision (Jabareen 2008). Presently, the search for solutions applicable to ecological cities which comply with sustainable development principles is one of the most important directions in urban planning. The following subsection briefly describes the history and defines the eco-urbanism concept.

2.5.1 Defining eco-urbanism

Eco-urbanism originates from the early 1980s when the sustainability concept emerged and Richard Register, an urban design specialist and activist, proposed eco-cities which consider the ecological carrying capacity of the city's bioregion (Tsolakis & Anthopoulos 2015). Register is also the pioneer for one of eco-urbanism's movements, namely the eco-city movement. Eco-urban development is a theory of how ecological living could be brought to urban communities (Holden et al. 2015). It draws on the concepts of metabolism and sustainability, therefore it has a wide array compared to its precedents, like New Urbanism and Smart Growth (Sharifi 2016). According to Lantitsou (2017) eco-development is a successful strategy for controlling and overcoming ecological crises. Regarding residential areas, eco-development aims to avoid overconcentration of urban centres and aims to strengthen both medium and small urban centres.

Eco-urbanism has emerged as a broad approach to urban design and planning which incorporates aspects of several interrelated movements, namely: ecological design, environmental art, landscape planning, sustainable design and planning, green architecture, green infrastructure, green urbanism, landscape urbanism and industrial ecology (Spirn 2012; Sharifi 2016). Sharifi (2016) characterises eco-urbanism as an overarching term for the culmination of the various movements mentioned above, developed to deal with the traditional challenges of urbanisation and to address those caused by climate change and resource constraints. A crucial distinctive characteristic of eco-urbanism is the inclusion of green technologies such as solar technology, net-zero energy building, renewable energy at home and wind power into urban developments (Sharifi 2016). While minimising ecological footprints and emphasising living in harmony with nature, the development of self-contained communities which have clearly expressed strategies for economic sustainability is crucial to some eco-urban movements (Pow & Neo 2015).

Models derived from the notion of eco-urbanism which are applied globally include those of eco-city, eco-town, eco-district, eco-quarter, eco-garden city, ubiquitous city, green city and resilient city (Suzuki et al. 2010; Joss et al. 2013; Caprotti 2014; Holden & Li 2014; Yigitcanlar & Lee 2014 and De Jong et al. 2015). Pertinent to this study is the idea of 'eco-blocks'. "Eco-blocks are designed as urban gated communities. The aim of an eco-block is to "…be resource self-sufficient… . in its operation… ." (Hodson & Marvin 2010: 303). This definition relates to eco-blocks designed and built in the global North. The eco-block is designed to generate its own electricity, recycle all its water and recycle waste on-site (Hodson & Marvin 2010). The strategy of eco-blocks is to construct integrated responses to infrastructure that covers several infrastructural networks like food, energy, water and waste. (Hodson & Marvin 2010). According to Hodson & Marvin (2010) these developments usually occur on greenfield sites or they are new

stand-alone developments located adjacent to or within cities. This strategy or response has at its core the vision and aspiration that they are able to transcend conventional notions of ecological constraint as they build ecologically secured infrastructures. Hodson & Marvin (2010) have however, questioned the sustainability of eco-urbanism models in creating fair and just cities.

Their concern revolves around eco-cities representing one particular response to the issues of climate change, resource constraint and energy security in a period of ecological emergency and economic crises. Hodson & Marvin (2010) argue that eco-urbanism is a transformative type of development that will allow cities to grow economically, while literally going beyond environmental constraints, thus requiring the need for wider social change. They contend that such developments should be seen as attempts to create neo-liberal environmental security, not on a city or global scale, but ecological security for elites. Developments of this nature may not facilitate the move towards sustainable development or sustainable cities. Moreover, they do not support the notion of 'just sustainabilities'.

2.5.2 Defining just sustainabilities

Just sustainabilities is a discursive frame and paradigm which emerged in the early 2000s and offers a more nuanced approach to the idea of sustainable development. The notion of just sustainability stems from the argument that the definitions provided by the Brundtland Report and the IUCN do not address the critical issues of justice and equity (Agyeman, Bullard & Evans 2002; Agyeman & Warner 2002; Agyeman 2005; Agyeman 2008). Therefore, Agyeman, Bullard & Evans (2002: 78) provide the following working definition of sustainability: "…the need to ensure a better quality of life for all, now and into the future, in a just and equitable manner, whilst living within the limits of supporting ecosystems." Regarding development – they argue that sustainability should refer to both physical and human development.

Just sustainability therefore stems from a common ground between environmental justice[14] and environmental sustainability (Agyeman 2005). It argues that a greater level of social and economic equity is required to secure a sustainable world (Agyeman et al. 2002). Similar to the notion of 'live in harmony with nature', that is human welfare and nature are interdependent, just

[14] The environmental justice movement is understood as a grassroots community reaction to external threats to a given community. These threats have been found in South Africa and other countries like England, the USA and Scotland to affect people of colour and low-income neighbourhoods unjustly (Agyeman 2005). The Commonwealth of Massachusetts (2017: 3) defines it as "…all people have a right to be protected from environmental hazards and to live in and enjoy a clean and healthful environment regardless of race, color, national origin, income or English language proficiency."

sustainability advocates a state in which environmental quality is linked to human equality (Agyeman et al. 2002). Environmental quality and human equity cannot be separated or seen as two individual components. According to Agyeman, Bullard & Evans (2002) sustainability cannot simply revolve around green or environmental concerns. For a society to be considered sustainable, integration is required between social needs, welfare and economic opportunity (Agyeman, Bullard & Evans 2002).

Agyeman (2008) pursued this point by criticising current approaches of sustainability, which in his view are highly orientated towards 'greening' or 'environmentally inclined'. He alleged further that current notions of environmental sustainability are largely based on intergenerational equity instead of intragenerational equity, a situation he referred to as the 'equity deficit' of environmental sustainability (Agyeman 2008). This environmental equity deficit gave birth to the environmental justice paradigm which redefined the term environment, to include "…urban disinvestment, racism, homes, jobs, neighbourhoods and communities" (Agyeman 2008: 752). The middle way between environmental sustainability and the environmental just paradigm is just sustainability. Therefore, just sustainability proposes a paradigm shift, where justice and equity should take centre stage in sustainability discourses to ensure a more sustainable future.

2.6 CONCLUSION

This chapter has given an exposition of the theoretical underpinnings of this study, specifically the theories relating to the phenomenon of eco-estates. Sustainable development has been established as the theoretical backbone of the study. The discussion has clearly shown that the aspiration to successfully employ sustainable development has resulted in many concepts and ideas culminating in various sustainability and planning related theories. The balance required between social, economic and environmental factors for achieving sustainable development is dauntingly difficult to strike given the multifarious challenges facing such endeavours today.

An alternative approach, ecological modernisation offers a win-win situation where economic growth is stimulated without increasing environmental degradation. Ecological modernisation is particularly relevant in this study because the development of eco-estates can be seen as a business in which new green products and technologies are being developed. This relates directly to the concept of eco-form premised on the belief that better design enhances the environment and increases energy efficiency. Moreover, since urban planning plays a crucial role in developing sustainable human settlements, the planning theory of eco-urbanism was also discussed. Although eco-urbanism addresses contemporary issues in terms of climate change and resource constraint, the question arose whether eco-urbanism models are able to create fair and just cities.

Consequently, the notion of just stainabilities – yet another approach to sustainable development – was examined and shown that a paradigm shift is required where justice and equity should take centre stage in sustainability discourses to ensure a more sustainable future. The next chapter is devoted to the study's first objective of reviewing the relevant literature.

CHAPTER 3 LITERATURE REVIEW

3.1 INTRODUCTION

In this chapter the literature on gated communities, eco-estates and green building practices is reviewed. First, a perspective is given on gated communities because in South Africa eco-estates occur exclusively in a gated community or estate form. This review concentrates on the history and emergence of gated communities. This background is given because the notion of gated communities is context-specific. Second, the literature on the forces driving the emergence of the gated community phenomenon are explored as they are context specific. These drivers have birthed influential ideas which have shaped the character and nature of gated communities in South Africa, particularly eco-estates. Third, works on the manifestation of eco-estates are reviewed. Fourth, the focus then moves to reviews of the literature related to the four other objectives of the study, namely: locational analysis of eco-estates in South Africa; the contiguity of eco-estates and eco-friendly estates with existing conservation areas; the categorisation of eco-estates; and investigate the degree to which eco-estates and eco-friendly estates contribute to greening interventions.

3.2 A PERSPECTIVE ON GATED COMMUNITIES

The idea of gated communities is not new. Walls created as physical divides between people, between people and animals, and for the ultimate purpose of safety and security are immemorial practices (Spocter 2012). The notion of gated communities is extremely broad and context specific (Blandy 2006). The walling of large tracts of residential land took early form around 300 BC, when the Romans established ‘gated’ villages in England as defences against external invaders (Blakely & Snyder 1997). Safety was the main ideology underpinning these communities and ‘gating’ was used as a means of protection against invaders and the unknown (Glasze et al. 2006). Lemanski (2004: 102) explained that, “[h]istorically, the pre-modern city constructed walls and gates to exclude undesirables and thereby minimise fear”. Low (2003: 13) has earlier made this point and highlighted that walls and gates functioned as important defence mechanisms in many ancient and medieval settlements to “…protect inhabitants and their property.”

The modern phenomenon of gating has spread throughout the world to the United States of America (USA), Australia, New Zealand, Eastern Europe, Brazil, India, Russia and South Africa, among many others, with the core purpose of providing personal and property security (Low 2003; Atkinson & Blandy 2006). Although high crime rates have accelerated the growth of gated communities in South Africa, contemporary urban and rural spatial forms have moved away from

legally enforced race-based segregation to fragmentation and segregation mainly based on class (Jurgens & Landman 2006). The increasing gap between the rich and the poor has contributed to the rapid expansion of gated communities, promoting urban fragmentation and segregation (Robins 2002 cited in Spocter 2012). The post-1994 expansion of gated communities in South Africa is thus defined by socio-economic factors shaped by historical events and high crime rates.

3.3 DEFINING GATED COMMUNITIES

Landman & Badenhorst (2012) have articulated 'need' as the basis for and start of purposeful processes of urban re-development and transformation. Because this need involves personal needs or desires. The definition of gated communities largely depends on the human motivation for the development. Thus, to clearly define the term gated community requires an understanding of *raison d'être*[15] for such developments.

Globally gated communities differ with respect to their characteristics and particularly, regarding various reasons for their development. For instance, gated communities in the USA made their appearance mainly for urban elites (Blakely & Snyder 1997). In Latin American countries the primary motive was the search for a high standard of living linked to favourable infrastructure and proximity to nature and leisure facilities (Coy & Pöhler 2002). The fear of crime in Latin American countries is also a noted reason as in Brazil where these communities emerged as reactions to high crime rates and fear of crime (Landman & Schöntiech 2002). Roitman (2010) elaborated on five main subjective causes suggested in the literature, namely increased fear of crime; a search for a better lifestyle; desire for a sense of community; a search for social homogeneity; and aspirations for higher social status and social distinction within particular social groups.

In South Africa the growth of gated communities is fuelled by both a demand and a supply side (Landman 2004). The most prominent drivers in South Africa are crime, fear of crime and violence (Landman 2004; Spocter 2016). According to Landman (2004) residents demand the right to safety, security and privacy, so placing great pressure on local authorities by residents to allow the closure of existing neighbourhoods. Developers have responded by investing in a supply of a range of gated communities across the country. Other noteworthy drivers are financial security, resource security, socio-cultural security and lifestyle security (Landman & Du Plessis 2007).

The various drivers or motivations for gated communities have led to the emergence of a variety of types of gated communities and manifested definitions. This no doubt explains why there is no consensus on the definition of gated communities despite the increasing body of literature on the

[15] Raison d'être is defined as a reason for existence (*Cambridge Dictionary 2018*).

phenomenon (Landman & Badenhorst 2012; Mahgoub & Khalfani 2012). Such a community has been broadly defined as "…a physical area that is fenced or walled off from its surroundings – either prohibiting, or controlling, access to these areas by means of gates or booms" (Landman 2004: 5). Landman (2006) avers that this concept or definition does not only apply to residential areas, but also to office parks and shopping malls which may also be defined as forms of gated communities. This study's scope is limited to residential gated communities, more particularly to eco-estates.

Gated communities in South Africa can be broadly grouped into enclosed neighbourhoods and security villages where 'village' is considered in a very broad sense (Landman 2004; Landman & Badenhorst 2012). Enclosed neighbourhoods are existing neighbourhoods which are closed-off for security purposes, whereas security villages[16] or developments comprise private gated communities with a variety of land uses, depending on the subtype. These range from large estates to medium and smaller gated townhouse complexes and apartment complexes and they can even include predominantly non-residential gated or security parks with a range of different land uses.

A number of subtype security villages have been identified in South Africa, such as lifestyle estates, nature or eco-estates, coastal estates, golf estates, senior estates and wine estates. There are no specific definitions of any of these estates, however there are distinctive characteristics. To add to the confusion, some estates – particularly the lifestyle estates – exhibit a combination of characteristics with an emphasis on amenities and facilities which cater for a specific lifestyle (Spocter 2016). For example, golf estates can be classified as golf and nature estates or golf and country estates, whereas others are exclusively classified as country estates. Durington (2006) and Landman & Badenhorst (2012) add that certain estates may share the same amenities, but have different branding and marketing strategies. Instead of emphasising security measures, estates like eco-estates use terms like 'nature' and 'eco' to emphasise the environment and other benefits offered by such developments as their principal selling point.

3.4 THE SUSTAINABILITY OF GATED COMMUNITIES

Because gated communities have a strong presence and are an influential urban subtype, they radically impact on urban form and the functioning of neighbourhoods and cities and therefore they can dramatically impact on long-term sustainability (Landman 2000a; Mahgoub & Khalfani 2012). While South Africa has no national policy on gated communities, a number of planning and development laws based on the notion of sustainable development directly affect the development

[16] The term 'security estate' is used interchangeably with 'security village' in this thesis.

of these communities. These include the Accelerated and Shared Growth Initiative for South Africa (ASGISA) and the Spatial Planning and Land Use Management Act (SPLUMA) 16 of 2013. But these policy documents make no mention of gated communities, or their specific types which occur in South Africa; namely enclosed neighbourhoods or security villages (Landman 2004).

Being predominantly residential developments, gated communities are guided by the development and planning standards applicable to residential developments set out in the SPLUMA. According to Landman (2004) three main paradigms derived from South African policies[17] post-1994 have guided development in the country. They are integrated development, sustainability and sustainable development, and safer settlements. Consequently the sustainability of gated communities in South Africa has been largely dependent on the residential policy framework in place. However, the lack of regulations governing the urban design of gated communities has resulted in complete freedom of the urban design to reduce common areas and increase private plot areas. This has led to several problems regarding spatial planning and the development of sustainable settlements.

Globally, gated communities are increasingly being recognised as a rapidly emerging housing type. Consequently, both international and South African literature has focused on the impact these developments have on sustainable development, especially on urban sustainability. Mahgoub & Khalfani (2012) examined the sustainability of gated communities and how society views this type of development in Doha, Qatar. Their findings suggest that gated communities have negative economic, social and environmental outcomes regarding urban sustainability. Landman (2000a) has investigated the potential future impact of gated communities on urban sustainability by evaluating six key issues of gated communities against the key dimensions of urban sustainability. It was found that gated communities have the potential to negatively affect the goal of urban sustainability. Landman & Du Plessis (2007) used the Five Capitals model to explore the impact of gated communities on the sustainability of the larger urban system. The Five Capitals model was developed by an organisation known as the Forum for the Future. The model involves five 'capitals' which are crucial elements required by a business to be able to deliver its products or services. The 'capitals' include, natural capital; manufactured or physical capital (fixed assets); human capital (people); social capital (social relationships and structures) and financial capital (profit and loss, sales, shares, cash) (Landman & du Plessis 2007). Their findings showed that

[17] The priority documents are the Accelerated and Shared Growth Initiative for South Africa (ASGISA), the White Paper on Spatial Planning and Land-use Management, the National Spatial Development Perspective and the Housing Atlas and the Comprehensive Plan for the development of Sustainable Human Settlements (Breaking New Ground).

while gated communities improve security, they have unintended consequences for public spaces in the city which lead to increased traffic, longer commuting times, increased air pollution and reduced opportunities for social exchange.

3.4.1 Social sustainability

The literature on social sustainability acknowledges that gated communities can enhance or reduce social cohesion in communities (Landman 2000a; Landman 2000b; Durington 2005). While social cohesion is sometimes attained within gated communities, for example through homeowner associations (HOAs), social interaction with the broader urban community is limited (Landman & Du Plessis 2007). Research in South Africa has identified several levels of conflict associated with gated communities, especially in enclosed neighbourhoods, such as conflict between residents, between those inside and outside and personal inner conflict (Landman & Du Plessis 2007; Chipkin & Meny-Gibert 2013; Duca 2013; Menon 2013). These conflicts are mainly related to social exclusion, increased vulnerability and equity concerning access to and use of public space and facilities. Landman (2000a) has observed that social conflict can impact the quality of life and also urban democracy in general, which does not result in sustainability.

Representatives of the private sector have criticised gated communities for reproducing the brutal social and spatial inequalities of the country through developments specially built for affluent South Africans (Newton & Schuermans 2013). Therefore, gated communities allow those who can afford to opt out of shared public services and places thereby enhancing social segregation and exclusion (Landman 2000a). Discrimination and high cost of housing have always enabled neighbourhoods to exclude certain classes of residents. Furthermore, Blakely & Snyder (1997) contend that casual passers-by and others from surrounding neighbourhoods, in addition to undesirable new residents, are also excluded by the presence of gates and walls. Landman (2000a) avers gated communities thus have the potential to impair the rights of residents and impact detrimentally on long-term urban sustainability and political stability.

3.4.2 Economic sustainability

According to Roitman (2010) the economic impacts of gated communities are mostly accrued to effects on housing and land markets and on the local economy. There are both advantages and disadvantages in terms of the economic effects of gated communities. While property values increase within the gated community, their presence can reduce the property values of surrounding non-gated communities (Le Goix 2005). Landman (2000b) points out that another key concern surrounds the economic sustainability of gated communities, is the costs involved in the establishment and the ongoing maintenance of the gated community.

3.4.3 Environmental sustainability

Economic and social development are highly reliant on the state of natural capital. Natural capital (the environment) is especially influenced by the development of gated communities. Natural capital is the natural resources and services[18] provided by the ecosystem which contribute toward climate regulation and the carbon cycle which ultimately enable life cycles to continue in a sustainable way (Landman & Du Plessis 2007). Security estates generally offer a certain lifestyle which is usually a major selling point for these estates (Landman & Du Plessis 2007). So as to protect this particular lifestyle, security estates tend to provide well developed and well-maintained natural spaces with stocks of natural capital such as indigenous flora and fauna, watercourses and access to open green space, clean air and water. These can indeed contribute positively to natural capital but they are heavily dependent on the kind of lifestyle the estate is expected to offer.

The Department of Environmental Affairs (2016) argues that the quantity of the water supply is one of the biggest impacts of lifestyle estates on natural capital. Landman & Du Plessis (2007: 21) have criticised security estates to be "…accumulating natural capital stocks." The Department of Environmental Affairs (2016: 72) has described such estates as "…green deserts, due to their lack of environmental value despite the seemingly natural environment." Whether fed by groundwater or municipal water, security estates reduce natural capital stocks both internally and externally beyond the walls of the estate (Landman & Du Plessis 2007). Landman & Du Plessis (2007: 21) have noted with the "…cumulative impact of these estates on the local and national water supply in an already water-stressed country." This has become vividly apparent in South Africa a decade later with the country in the tenacious grip of a major water crises due to severe drought conditions across the country. Landman & Du Plessis (2007) also voice concern over the equitable distribution of this vital and scarce resource between those within the gates and those outside.

Another environmental consequence of gated communities, particularly with security villages, is the issue of urban sprawl. Often located among pristine natural contexts due to the aesthetic appeal of the natural environment on the urban periphery, these estates continuously contribute to urban sprawl. This is troublesome as sprawling cities are often perceived to be incredibly inefficient and unsustainable (Turok 2011). Urban sprawl inevitably results in increased levels of auto-dependence with their far-reaching consequences namely increased traffic congestion which could potentially decrease the efficiency of the country's economy (Turok 2011); increase air pollution from emissions of carbon dioxide (CO_2), thus affecting air quality (Landman & Du Plessis 2007);

[18] Services such as sinks which absorb, neutralise or recycle wastes; renewable resources; non-renewable resources and processes or life-supporting systems.

and decrease the opportunities for sustainable public transport (Landman 2004). Third, the upgrading of infrastructure to accommodate these developments, such as the widening of roads further increases levels of pollution and changes the micro-climate when trees and vegetation are removed, resulting in further loss of natural capital (Landman & Du Plessis 2007). Furthermore, the costs are immense of expanding and upgrading water and sewerage systems to reach the sometimes peripheral locations of the gated communities.

Finally, the location of certain gated communities on the urban periphery infringes the availability of high-potential agricultural land on the urban periphery (Spocter 2013). Urban sprawl not only has deleterious environmental repercussions, but also affects city planning in South Africa where the aim is to achieve urban consolidation or compaction (Schäffler et al. 2013). Thus, gated communities have significant impacts on urban form and functioning. The social, economic and environmental influences of gated communities are capable of drastically affecting the sustainability and ethical credibility of any type of gated community in South Africa.

In consequence, De Beer (2014: 45) argues in her report on the evolution of lifestyle estates that "…there has been a shift to more natural-based estates that are considered environmentally sustainable." An evolution of security estates has occurred, especially of the latest kinds of lifestyle estates in South Africa, such as wildlife, country and eco-estates (De Beer 2014). De Beer's (2014) findings indicate that these types of estates are not only environmentally sustainable, but they also have a beneficial impact on financial implications. This evolution is not only a response to the indispensable nature of sustainability and building of green developments (King 2016) but, according to De Beer (2014: 102), there is "…a national demand for safe, secure living environments with some form of a green lung."

3.5 ECO-ESTATES AS THE NEW GATED COMMUNITIES

Since gated communities in South Africa have been rebranded to being environmentally aware, their social credibility has slightly improved (Ballard & Jones 2011). Security, exclusivity and open space is not only provided by these relatively new estates, but they also provide an escape from urban life and an opportunity to "…reconnect with nature" (Ballard & Jones 2011: 3). According to Hello House (2016: s.p.) "[a] rural-esque experience without the safety concerns is a major drawing card." Bagrie & Ernstson (2017) point out that their location on pristine land outside the urban edge not only presents a problematic pattern of urban development in South African cities, but also raises questions about the adverse social and ecological effects of this type of development.

Notwithstanding these effects, this type of estate has become extremely popular in South Africa (Harrison et al. 2008 cited in Landman & Badenhorst 2012). In a short period, eco-estates have evolved from being an unknown concept to the existence of more than 50 across the country in 2006 (Koblitz 2006). Other estates that do not necessarily use this label, still exploit nature in their design and marketing (Ballard & Jones 2011). Von Geusau (2017) reported that a motivation for the growth of these developments is thanks to their apparent concern for environmental sustainability.

According to Landman & Badenhorst (2012) one of the main distinctive features of 'nature' or 'eco' estates is proximity to nature and the incorporation of many natural elements, even wildlife into their design. Like other security village or estate sub-types, there exists no formal, agreed South African definition of an eco-estate nor any legislation in South Africa defining a low-, medium- or high-density housing development or the requirements for an eco-estate (Grey-Ross et al. 2009; Sherriff-Shüping 2015). Hello House (2016) contends that population density is the distinguishing feature of an eco-estate. Koblitz (2006) and Hello House (2016) maintained that these estates strive for one to five homes per hectare as opposed to the usual 20 or more homes per hectare found in other gated communities.

In attempt to find out what constitutes of an eco-estate to direct potential eco-estate buyers in South Africa, Koblitz (2006: 24) found that the term 'eco-estate' truly belongs to estates that "[d]o not introduce an artificial concept onto the landscape – such as golfing, equestrian centres or vineyards; allow no agricultural activity at all; and are relatively inexpensive to establish, relying mostly on nature's own landscaping rather than man-made landscapes… .." A relatively recent study on eco-estates in South Africa defines the phenomenon as an alternative form of residential housing development, in which houses are "... designed to minimise impacts of the houses built in that particular area on the surrounding environment by using materials and processes that are considered to be environmentally friendly" (Sherriff-Shüping 2015: s.p.). The research investigated whether or not estates in Gauteng that marketed themselves as 'eco' are sustainable by determining their overall environmental sustainability score. The definition by Sherriff-Shüping (2015) suggests that eco-estates not only incorporate natural elements such as open space or wildlife habitats in the development, but also other greening interventions, such as green building principles too. Because Sherriff-Shüping (2015) concluded that there is no single way of defining an eco-estate or what it must be, she questioned the integrity of the term.

A study conducted in Durban, dealt with the impact of race and space on the development of gated communities, defines an eco-estate as "…part of a larger trend in tourism and other industries that

seeks to highlight environmental awareness and/or practices that work in unison with the environment with the goal of limiting harm to nature" Durington (2006: 151). The author added that for eco-estate developers and residents, a gated community is conceptualised on ideas of ecology and the environment which are regarded as safer issues to handle rather than features of crime, fear or racial exclusion. Grey-Ross et al. (2009) define an eco-estate as a development in which natural vegetation and fauna co-exist and are projected as conserving biodiversity, since the extent of the development is limited. This definition focuses on the need for open space in these types of developments. The following section focuses on the history and origin of eco-estates which assists in understanding the definition of a South African eco-estate.

3.6 HISTORY AND EMERGENCE OF ECO-ESTATES: CONSERVATION DEVELOPMENT

Conservation development is the foundation of eco-estates in South Africa. The concept was popularised by Randall Arendt's (1996) book, *Conservation design for subdivisions*. Conservation subdivisions were rooted in the book and they have since been grouped into an umbrella term known as conservation development where housing is clustered together on smaller lots, allowing for open space and the most important ecological areas to be permanently protected (Arendt 1996). Arendt (n.d.) also suggested that typically 50% or more of the buildable land should be conserved. This concern for the conservation of natural spaces during development is not a recent phenomenon. Both Howard (1902) and Perry (1929) promoted centralised open space in communities for the benefit of residents, while the clustering of subdivisions to allow for interconnected networks of suburban open space was promoted by Whyte (1964).

This idea of clustered housing has become central to the idea of conservation development, as proposed in contemporary theory and practice by Randall Arendt. In the early 1980s Randall Arendt, a British-trained planner, combined concepts from the 1960s, such as cluster and open space design, with Ian McHarg's 'design with nature' philosophy into a book, '*Dealing with change in the Connecticut river valley: A design manual for conservation and development*' (Yaro et al. 1993). Since then these ideas have been advanced and refined in other books by Arendt.

Globally, housing development and residential land consumption per person have emerged as key drivers of land-use change (Bradbury et al. 2014). Owing to private land-use change, public protected areas are no longer sufficient to conserve environmentally sensitive areas (Kamal et al. 2015). Human disturbances such as light, noise and domestic animals are introduced to biological communities due to residential development (Hansen et al. 2005). Low-density residential development, often occurring near public protected lands, is of particular concern as it expands the

environmental impacts of each house over a large area, thus increasing the cumulative footprint of housing development and infrastructure (Hansen et al. 2005). Hence, conservation development has emerged as an alternative growth strategy, in response to the significant loss in biodiversity and ecosystem services due to low-density sprawling residential development (Pejchar et al. 2007; Mockrin et al. 2017). The market for conservation development has grown significantly with many forces driving the phenomenon.

The most significant is the change in regulations to motivate conservation in developments in order to reduce negative environmental impacts and to manage growth (Arendt 2004). Conservation developments may be adopted due to the financial advantage of private developers (Milder 2007). Milder (2007) has argued that eco-entrepreneurs[19] are profiting on market opportunities and conservation requirements to create economically practical projects in a range of settings. Mockrin et al. (2017) agree that developers have a financial advantage when developing conservation developments as costs are reduced by clustering homes and they are able to secure a price premium for homes since living in proximity to open space is valued.

3.6.1 What is conservation development?

Pejchar et al. (2007) have evaluated the benefits and drawbacks of conservation development in terms of economic, biophysical and institutional perspectives in the USA and declared that conservation development is difficult to define. Carter's (2009) case study in uses Georgia, USA evaluated the benefits of and barriers to implementing conservation development and concluded that because there is a no ecology focused definition, the term is used in a broader sense. Carter (2009) contended that a robust definition would include a clear expression about the ecological formation and functioning of the plot and the sustainability of these resources. The concept has been used to describe projects with some open space amenities to others that set out to deliberately protect and restore important parts of ecosystems.

Pejchar et al. (2007) give a definition for use in the field; namely "[c]onservation development is a form of development that relies on scientific assessments of the ecological importance of a property's assets to identify what parts of a property should be developed in a manner compatible with the protection of these assets" (Pejchar et al. 2007: 70). Milder (2007: 758) on the other hand, provides an overview of what constitutes conservation development, defining it as developments that "…combine land development, land conservation, and revenue generation while providing

[19] Eco-entrepreneurs are individuals who develop new technologies for operating factories with minimal impact on the environment (Jasinowski 2015). These entrepreneurs make use of sustainable and green manufacturing to ensure the manufacturing process has the least impact on the environment.

functional protection for conservation resources." Reed et al. (2012: 259), refer to it as a "…land-use planning tool that requires a portion of a residential property to be set aside for conservation purposes." The open spaces may be designed specifically to protect the environment or agriculture lands, heritage or historic sites, or aesthetically pleasing sites (Doyle 2004; Pejchar et al. 2007; Milder & Clark 2011). The result is that each conservation development has a form unique to its location (Doyle 2004). Pejchar et al. (2007) add that the development should provide continuous stewardship of the conserved area of the parcel in order for it to be considered as conservation development.

Along with continuous management, these developments are built according to specific regulations which provide design guidelines for planning and arranging their set up (Reed et al. 2014). These are the distinguishing parameters compared to conventional developments, which usually do not involve any conservation of land, although regulations may prohibit building in some areas (Pejchar et al. 2007). The main goal of conventional developers is to develop the maximum number of homes allowed. Any natural elements that remain in the final development are disconnected from other natural elements in the broader landscape or region and simply have aesthetic value (Pejchar et al. 2007).

Differentiation must be made between conservation development and open-space development. Open-space development – a form of clustered development, where conservation goals are not reflected in their design and instead it concentrates on aesthetic values and recreational opportunities (Pejchar et al. 2007; Carter 2009). Carter (2009) contends that if this differentiation is not made, it could have ecological consequences and present the potential for greenwashing conservation development. For implementation to be successful, knowledge of the various types of conservation development projects is required.

3.6.2 A typology of conservation development

Conservation development is an umbrella term that includes many environmentally aware forms of development. Milder (2007) has overviewed what constitutes conservation development. According to Milder (2007), there are various types of conservation development, however they do share common elements. First, all projects include the setting aside of conservation land which is owned by a conservation organisation or protected by a conservation easement. Second, all include development which serves to finance the development's conservation element. Third, projects are developed through ecology-based planning and design – in which planners make an inventory of the site's natural resources and environmental conditions and thereafter situate development on sites of lower conservation value. This is a critical part of conservation

development as it determines the success of the project at the end (Arendt 2004 and Carter 2009). Finally, various design features are included in conservation developments to assist in reducing the negative impacts of development, such as indigenous landscaping, avoiding alien species and green building features (Wilson et al. 1998).

Based on interviews, examinations of a nationwide sample of conservation developments in the USA and an analysis of literature in this emerging field, Milder (2007) produced a conservation development typology as reproduced in Figure 3.1. He reasoned that conservation development is not limited to clustered housing, instead it comprises four categories of land-use strategies. It is noteworthy that the typology typifies North American conditions.

Type 1 – conservation buyer projects – involves private landowners who agree to restrict future development to one or a few homes by donating or selling a conservation easement. The permitted homes are either embedded within the easement or subdivided as separate land parcels, in which they usually abut the protected land. Development density is very low in this type.

Table 1. Summary of conservation development techniques.

	Conservation-with-development approaches		Development-with-conservation approaches	
Distinguishing characteristic	Type 1: Conservation buyer projects	Type 2: Conservation and limited development projects	Type 3: Conservation subdivisions	Type 4: Conservation-oriented planned development projects
Typical development density (see note)	Minimal: limited to housing for the landowners and their family	Limited: typically 5%–25% of ordinarily permitted density	Full: 100%–200% of ordinarily permitted density	Varies; typically relatively dense
Typical project proponents	Land trusts, landowners	Land trusts, landowners, developers	Developers	Developers
Typical economic model	Private owners agree to conservation restrictions while retaining the right to build a small amount of new development	Participants use limited development to finance conservation or to create a multiobjective for-profit project	Goal is to maximize developer profit	Goal is to maximize developer profit
Typical development patterns	One or a few houses in a rural setting	Single-family housing in a rural, exurban, or suburban setting	Single-family housing in a suburban or compact village layout	Mix of housing types and other land uses in a suburban, urban, or village layout
Most relevant public policies (local, state, and federal)	Tax incentives for donating conservation easements	Local zoning, tax incentives for donating conservation easements	Local zoning	Local zoning

Note: Development density is characterized in relation to the ordinarily permitted density in the area where the project is taking place, which may vary from region to region. To encourage developers to use the conservation subdivision technique, land-use regulations sometimes offer a "density bonus" permitting more houses than would be allowed in a conventional development; the size of this bonus varies by jurisdiction.

Source: Milder (2007: 761)

Figure 3.1 Typology of conservation development

Type 2 – conservation and limited development projects – are usually of low-density, about 5-25% of the maximum density allowed by land use regulations and conservation is funded from this

limited development (Milder 2005). Compared to conservation buyer projects, this is a much higher density and involves land subdivision, permitting and designing of utilities and infrastructure to enable an individual house erven to be sold. This type is made possible by land trusts, developers, investors or landowners. A model within this type involves the combining of development which is limited with the supply and sale of ecosystem services from restored wetlands, forests or wildlife habitat.

Type 3 – conservation subdivisions – involves clustering development on smaller erven than those in conventional subdivisions (Milder 2007). According to Carter (2009) a key feature of conservation subdivisions is that ecologically significant open space is protected. Arendt's (1996) classification of primary conservation areas (PCAs) and secondary conservation areas (SCAs) contributes to what constitutes 'ecological significance' in conservation subdivisions. PCAs is land considered unsuitable for development, such as floodplains, wetlands and steep slopes, while SCAs comprise locally significant features such as stream valleys, prime farmland, mature woodlands, wildlife habitats, travel corridors and important historic sites (Arendt 2004). The original form of the open space should be preserved in its natural state as much as possible and the permitted uses in the open space should be screened so to maintain the desired ecological function (Carter 2009). For example, golf courses and road construction are usually not allowed in such developments.

Conservation subdivisions are built at or near the maximum density allowed by zoning. In addition, compared to Type 2, protected land is managed by a HOA. Such associations have been criticised for not being fully able to manage land effectively since they often lack the knowledge or skills to do so (Austin & Kaplan 2003). Furthermore, their management goals differ from those conservation subdivisions set out to achieve (Austin & Kaplan 2003). Instead, HOAs place importance on aesthetics, privacy and recreational use. Austin's (2004), investigation of residents' perspectives of open space conservation subdivision in south-east Michigan and found that an understanding of the concept was not being adequately transferred from planning officials and developers to residents. Conceivably this is the case with HOA's.

While conservation subdivisions are said to improve conservation outcomes (Odell et al. 2003; Pejchar et al. 2007), the results found by Lenth et al. (2006) indicate otherwise. Lenth et al. (2006), examined the ecological implications of conservation subdivisions by comparing them with conventional, dispersed housing developments. They found that there were no significant differences between the two and that they were less resourceful than undeveloped sites in the vicinity regarding bird, mammal and native plant conservation. Moreover, Austin (2004) and

Bowman & Thompson (2009) point out findings that conservation subdivisions contribute to and suffer from the negative effects of urban sprawl. Hence, the use of conservation subdivisions as an alternative design does not necessarily contribute to increased use of public transport, reuse of existing infrastructure or the provision of affordable housing. Arendt (2004) and Bowman & Thompson (2009) advance that conservation subdivision should be used with other planning options such as density bonuses, growth boundaries and urban re-development to minimise the impact of subdivision development at local and regional scales.

Type 4 – conservation-orientated planned development projects are planned developments which are large-scale projects varying in size from hundreds to thousands of hectares (Milder & Clark 2011). Generally, developers design and build the community while land trusts or government agencies manage the conserved lands. Type 4 is characterised by a range of housing types and often include commercial, recreational or public spaces. Owing to their nature of being fairly large, these developments are able to protect significant areas of natural resources (Milder 2007), compared to conservation subdivisions which have been criticised for not protecting sizeable land (Daniels 1997). According to Heide (2004) these projects often protect 50% or more of the project site. However, as Milder (2007) contends, the use of the open space is crucial because it is used more for recreational and aesthetic purposes than for conservation, it could become disconnected from providing important ecological functions locally and regionally.

3.6.3 Linking conservation developments to regional and national conservation spaces

Advocates of all four types of conservation development projects envision that the ecological benefits will extend beyond the borders of each development. Consequently, land will be protected and ecosystem services preserved at the landscape level and extended to encompass publically protected lands (Milder 2007; Carter 2009; Freeman & Bell 2011). This will maintain connectivity across landscapes to benefit wildlife and ecosystem processes that require large, contiguous areas of undisturbed land. It is also vital to remember that land conservation needs will inevitably increase with climate change. Therefore, this vision of conservation development has a direct link to the notions of sustainability. Porter (2012) reminds us that the awarding of special attention to conserving natural qualities and resources in development projects is a central theme of sustainability.

Protected areas are a cornerstone for maintaining a healthy environment for people and nature (UNEP-WCMC & IUCN 2016). However, protected areas cannot slow down the loss of global biodiversity alone (Rodrigues et al. 2004). The avoidance of additional loss of biodiversity and the maintenance of ecosystem functioning demands innovative alternative approaches. Consequently,

greater importance is being placed on conserving biodiversity outside formally protected areas (Goodman 2003). Conservation development projects aim to protect green infrastructure, provide habitat refugia, maintain landscape connectivity and buffer nature reserves (Arendt 2004; Milder 2007). A key benefit touted by advocates of conservation subdivisions is the provision of a linked network of open spaces, enabling habitat and travel corridors for localised and wide-ranging species (Freeman & Bell 2011; Hostetler & Ill 2015). While conservation development projects may not be able to conserve large patches of connected habitat, conservation of small, disconnected patches of indigenous habitat can also promote biodiversity (Hostetler & Ill 2015). Maintaining and improving the natural corridors that thread through development sites not only help to counter habitat fragmentation (Brown 2000), but also contribute to sustainable design (Porter 2012).

Porter (2012) has observed that such corridors are recognised as green infrastructure systems. These systems include a range of ecological systems, such as a variety of park and recreation lands, conservation areas and natural features, although Benedict & McMahon (2012) note that green infrastructure has different meanings depending on the context. However, Benedict & McMahon (2012) and Porter (2012) do agree that green infrastructure is the ecological framework required for human, social and economic welfare: in short, it is a crucial natural life-sustaining system.

The term ‘infrastructure’ underlines the importance of hydrological systems and natural landscapes as integral components of urban systems. It implies that the conservation of natural elements is just as important as constructing road and water networks as essential components of the built environment (Porter 2012). Greenways or green pathways are fundamental components in green infrastructure systems so that according to Porter (2012) many public agencies and non-profit organisations are establishing greenways. These “[g]reenways connect stream valleys and wetlands, ridges and ravines, woodlands and meadowlands, and other elements of the natural landscape” (Porter 2012: 29). For example, trails are established as pathways linking natural areas in development sites or as connections between developments. As trail systems greenways offer a variety of benefits like opportunities for recreation, protection of habitats and indigenous vegetation, appreciation of nature and they encourage biking or walking.

Such trail systems and corridors have been recorded in studies of conservation development projects. Beuschel & Rudel (2010) enquired whether real-estate developers in Rocky Ridge, New Jersey, can be green and found that environmental practices adopted by developers included site plans, trees and green technologies. The authors concluded that developer practices are of prime importance as their design decisions can either lessen or magnify the damage done to the site. They

found that subdivisions and township-preserved land contributed to large areas of contiguous open space in the study locale, with an extensive trail system connecting parcels of land (Beushel & Rudel 2010). Paradoxically they found that developers made the greatest contributions to creating open spaces and tree preservation, but they also build the largest homes, thus damaging the environment the most.

Milder & Clark's (2011) nationwide assessment of conservation development projects and practices in the USA found that conservation development protected four million hectares of land in the country and accounted for 25% of private-land conservation activity nationwide. In addition, 42% of these projects provided buffers with existing protected areas. Conservation objectives did however differ among the sampled project, ranging from conserving water resources, scenic resources, outdoor recreation and education to historic or cultural sites, and some also had the objective of buffering other protected areas.

A study of the environmental sustainability of conservation subdivisions in Waukesha County, Wisconsin, Göçmen (2013) showed that 2500 acres of land were protected through conservation subdivisions. More than 700 acres of land (28%) was adjacent to environmental corridors and wildlife habitats and most were maintained in similar land cover types. However, some of the conserved open space were not maintained in their natural condition.[20] The study also revealed that 175 acres (7%) of the conservation subdivisions formed contiguous open space with neighbouring subdivisions and there was additional conserved open space outside the subdivision, so buffering it from other developments. Overall, it was found that while conservation subdivision was protecting more land from being developed compared to conventional developments, large impervious surfaces and fragmented wildlife habitats were created.

Mockrin et al. (2017) investigated how conservation development contributes towards forming networks with existing protected areas in Colorado and found that three out of every four developments they examined were located next to a type of protected area. The most common was the open space of another conservation development subdivision, followed by local and private or NGO protected lands and, least frequently federal and state lands. Some subdivisions were neighbouring two or more types of protected areas. They also found evidence of conservation subdivisions forming clusters and which are adjacent to other developments of its type. Mockrin et al. (2017) concede that only knowing that a conservation subdivision is positioned next to

[20] An example was cited where the common space that is conserved is mown and not maintained as land cover similar to the surrounding wildlife habitats.

protected areas does not indicate how much of its border overlaps with protected areas, such information would confirm the degree of connectivity with protected lands.

The spatial expansion of property developments impacts not only on resources, but on the environment at large. Beuschel & Rudel (2010) warn that when real-estate developers decide on the size, location and layout of buildings, they shape landscapes for decades to come and the design has relatively long repercussions for a building's environmental performance. Clearly, developers profoundly influence our sense of place and often, through their decisions on whether to preserve open space or not, they determine the future of local ecologies. The manufacturing, design, construction and operation of domestic and commercial buildings are also important causal factors as they are responsible for the consumption of many natural resources. Furthermore, the built environment plays a crucial role in determining the way in which land and energy are used thereby directly influencing greenhouse gases (GHGs), thus impacting on climate change (Beuschel & Rudel 2010). Sustainable development, along with other supporting devices such as conservation development, technologies and concepts, have emerged to bolster sustainable construction – which has become a necessity today and not just a trend or luxury as pointed out by African Green Elements (2016).

3.7 SUSTAINABLE CONSTRUCTION

The notion of sustainability has become increasingly significant in the current economic and climatic environments. Brebbia & Pulselli (2014) contend that the most efficacious way to achieve sustainability is to reduce the global environmental changes Earth is undergoing attributed to anthropogenic climate change. The built environment generates the greatest environmental impacts of all other industries (Samer 2013; Brebbia & Pulselli 2014), although it is also responsible for many social and economic impacts (Sev 2009). The manufacturing stages of building materials and the operation phase of the building are both major sources of global GHG emissions (Gunnell 2009; Kibert 2016). Reductions in energy efficiency in the construction and operation of buildings present significant opportunities to lessen the anthropogenic impacts on climate change.

Building construction, operation and deconstruction consume 40% of global energy and approximately 15% of the world's fresh water resources while producing some 23-40% of the world's GHG emissions (Gunnell 2009). The operation of the building sector in South Africa is accountable for 23% of GHG emissions, while emissions from the manufacture of materials for the building sector contribute around 5% of the total CO_2 emissions (Milford 2009). Depending on the region in the world, the construction industry's waste varies between 15% and 50% of all

waste generated (Roberts 1994). According to (Kibert 1994 in Sev 2009: 163), "[a] truly sustainable construction project should incorporate economic, social and environmental issues in the planning, construction and demolition stages, with the aim of providing a building that is affordable, accessible and environmentally conscious." Essentially sustainability should be the backbone of any development project's life cycle.

The sustainability paradigm is changing the manner in which buildings are constructed, including how the Earth's resources are being distributed (Kibert 2016). This has led to the emerging concept of 'sustainable construction' which is a facet of sustainable development that addresses the role of the built environment's contribution to the overarching goal of sustainability (Kibert 2016). The terms 'high performance', 'green building' and 'sustainable construction' are generally used interchangeably, although Kibert (2016) asserts that the term sustainable construction comprehensively addresses the ecological, social and economic issues of a building in the context of its community. The United Nations Environment Programme (UNEP) concedes that owing to the interchangeable nature of these terms, there is no universally accepted definition of sustainable construction (UNEP 2003).

A pioneering definition of sustainable construction was proposed in 1994 by Task Group 16 of the International Council for Research and Innovation in Building and Construction (CIB), an international construction research networking organisation. They defined sustainable construction as: "creating and operating a healthy built environment based on resource efficiency and ecological design" (Kibert 2016: 10). A clarification of the concept is: "…sustainable construction, in its own processes and products during their service life, aims at minimizing the use of energy and emissions that are harmful for environment and health, and produces relevant information to customers for their decision making" (Huovila & Richter 1997 cited in Huovila 1998: 7). Lanting (1998: 6) explained the concept as "…a way of building which aims at reducing (negative) health and environmental impacts caused by the construction process or by buildings or by the built environment." The European Union views sustainable construction as "…the use and/or promotion of a) environmentally friendly materials, b) energy efficiency in buildings, and c) management of construction and demolition waste" (UNEP 2003: 7). Du Plessis' (2005) review of the international debate on sustainable building and construction established that these early definitions mainly focused on environmental impacts.

The Agenda 21 for Sustainable Construction, published in 1999 by the CIB, was an attempt to create a global framework and terminology for sustainable building and construction and it also highlighted various issues regarding the definition of sustainable construction. These issues

emanated from differences between developed market economies, transitional economies and developing countries where the priorities, scales and types of challenges and barriers to be faced were all different (Du Plessis 2005). To achieve a holistic definition an Agenda 21 for Sustainable Construction was developed for developing countries. The document was launched at the World Summit on Sustainable Development and "…defined sustainable construction as a holistic process aiming to restore and maintain harmony between natural and the built environments, and create settlements that affirm human dignity and encourage economic equity" (Du Plessis 2005: 7). Du Plessis (2005) contended that, unlike the previous definitions, this one implies that sustainability is more than a reduction of negative impacts, instead it is also about restoring the environment and it involves the economic and social aspects of sustainability.

There are seven principles of sustainable construction which have been articulated to inform decision making during each phase of the design and construction process and continuing throughout the building's life cycle (Kibert 2016). The principles are: 1) reduce resource consumption (reduce); 2) reuse resources (reuse); 3) use recyclable resources (recycle); 4) protect nature (nature); 5) eliminate toxics (toxics); 6) apply life-cycle costing (economics); and 7) focus on quality (quality) (Kibert 2016). These principles also apply to the resources required to create and operate the built environment throughout its life cycle, namely land, materials, water, energy and ecosystems. The principles and methodologies of sustainable construction are applied and achieved through 'green building'.

3.7.1 Green building

Green buildings are defined as: "…healthy facilities designed and built in a resource-efficient manner, using ecologically based principles" (Kibert 2016: 11). The term does not refer to an individual building, rather to the whole process and life-cycle of building (Gunnel 2009). According to Zhang (2015) the notion of green building was initially put forward in the 1960s as 'Arology' by Paolo Soleri – an architect who combined ecology and architecture. Like sustainable construction, green building is variously defined with no universally agreed meaning, so that there is much ambiguity in its implementation (Zachariah et al. 2002). Terms such as 'ecological design', 'green design' and 'ecologically sustainable design' add to the confusion. Kibert (2016) affirms that these terms differ in the sense that they describe the application of sustainability principles to building design.

Chatterjee's (2009: 28) examination of green building and examples of practices in India defines green building as: "…a process to create buildings and infrastructure that minimise the use of resources, reduce harmful effects on the ecology and create healthier environments for people."

He insists that the green building practice is an essential requirement for sustaining the urban future, enhancing the health of ecosystems and protecting natural resources. Sarma (2014: 65) evaluated the problems, progress and future prospects of green buildings in Guwahati City, Assam and defined the term as "…the practice of creating structures and using processes that are environmentally responsible and resource efficient throughout a buildings [sic] life cycle, from design, construction, operation, maintenance, renovation and demolition." The green building movement addresses many of the current environmentally related issues, such as pollution, waste, depletion of natural resources and energy.

3.7.2 Green building practices

Kibert (2016) believes that by adopting green building practices,[21] the ultimate goal of achieving sustainability throughout all phases of the built environment's life cycle is achievable. Green building practices are applicable to any form of development, new or existing and at any stage of development, bearing in mind that bigger, less efficient buildings will cost more to green. According to LeGates & Stout (2015), such retrofits and new building standards are the starting point for any sustainable future but not the final solution. The following three subsections will discuss green building practices related to energy, water and waste.

Environmental sustainability measures as per the South African national building regulations, need to be incorporated in all new and refurbishment housing developments, starting with energy efficiency (SANS 10400-XA 2011). Energy efficiency and the introduction of more renewable sources of energy is a current priority for South Africa as it focuses on medium-term national power supply shortages and steeply rising electricity tariffs (King 2016). Energy supply and use not only impacts global warming, but also environmental impacts such as air pollution, acid precipitation, ozone depletion, forest destruction, and emission of radioactive substances (Dincer 2000). Energy efficiency is key to assuring the quickest way of addressing energy security as well as environmental and economic challenges (IEA 2017). Central to green building is achieving low carbon emissions through energy efficiency (Gunnell 2009). According to the CoCT (2012) energy efficiency not only reduces negative environmental impacts, but also the operating costs of the building. Concerning energy conservation or efficiency, the main goal is to reduce the consumption of fossil fuels and increase the use of renewable energy sources (Sev 2009), by

[21] The act of applying sustainable construction principles to the built environment to achieve the notion of a 'green building' has been termed variously in the literature. For example, Gunnell (2009) refers to it as 'techniques and strategies for green building', while LeGates & Stout (2015) refer to it as 'green technologies'. In this thesis the term used is 'green building practices'.

adopting a number of approaches. Passive building, alternative energy sources and energy efficient equipment are discussed in the following four sub-subsections.

3.7.2.1 Energy-efficiency

Building energy efficiency can be improved by implementing either active or passive energy-efficient strategies (Sadineni et al. 2011; Samer 2013). Improvements to heating, ventilation and air conditioning (HVAC) systems and electrical lighting can be categorised as active strategies, whereas improvements to building envelope elements can be classified under passive strategies. The indoor and outdoor environments of a building are separated by a building envelope. The building envelope is the key factor determining the quality and controls of the indoor conditions, irrespective of transient outdoor conditions. Various important components such as walls, fenestration, roof, foundation, thermal insulation, and shading devices constitute of the building envelope (Sadineni et al. 2011). According to Aksoy & Inalli (2006) the building shape and orientation are passive design parameters.

The CoCT (2012) refers to this as passive solar design. Along with the CoCT, South Africa's major metropolitan provinces, Gauteng and KwaZulu-Natal, also promote passive solar design in their green building guidelines (Bellingham et al. 2009; Gauteng Department of Infrastructure and Development 2015). Passive solar design improves indoor comfort such as heating, air conditioning and natural lighting and ventilation which reduces the demand for artificial resources in this regard. Orientation, shading, ventilation openings and glass selection are the essential elements in passive solar design (CoCT 2012). Passive heating and cooling can also be achieved through vegetation (Sev 2009). Passive cooling involves strategic shading combined with ventilation and evaporative cooling (Gunnell 2009). Sadineni et al. (2011) argues that these strategies are being envisioned as feasible solutions to environmental issues concerning of energy and pollution.

The incorporation of energy-efficient and renewable energy into a building reduces the demand for electricity during high usage times, thereby reducing the associated carbon emissions (CoCT 2012). Greater use of renewable energy sources such as water, wind and solar alternatives like geothermal energy will assist in eliminating dependence on fossil energy sources. These alternatives are eco-friendly since they do not emit pollutants and thus are sustainable (Sev 2009). It is worth noting that some renewable resources are not completely clean, however there are other options of cleaner energy compared to conventional energy (Dincer 2000). On-site power generation promoted by the CoCT (2012) are photovoltaic panels and wind generation. Solar photovoltaic (PV) panels produce energy from the sun. A panel can produce around 70 watts at 12

volts for roughly six or seven hours per day (about 0,4 kWh/day). A complete off-grid system includes a battery to store solar PV-generated electricity for night-time use and a regulator to protect the battery from overcharging or over discharging (CoCT 2012). Currently solar energy proves to be more cost-effective than small-scale wind energy due to the available technology.

Compared to existing power supplies, renewable energy can be costly at first, but it fails to consider the overall environmental cost. Renewable energy costs involve initial setting up costs which is much less than coal and nuclear power which are associated with continuous fuel costs and major costs at the end of the plant's life cycle, such as decommissioning of the plant and safe storage of the nuclear waste. Therefore, there is a need to combine renewable energy supply from less consistent sources, such as wind and solar, with more consistent sources, such as biogas and natural gas (Bellingham et al. 2009; CoCT 2012; Gauteng Department of Infrastructure and Development 2015). Such a balance of sources will assist in meeting residents' energy requirements.

According to Sev (2009) the operational energy consumption, which forms part of the greater energy costs of a building can be reduced through the use of energy-efficient equipment. Using energy-efficient equipment is among the most inexpensive and effortless method of applying energy efficiency, so improving the economic and environmental performances of existing developments (CoCT 2012). Energy-efficient light bulbs, such as Compact fluorescent light bulbs (CFLs) can substantially reduce energy costs. Bellingham et al. (2009), CoCT (2012) and Gauteng Department of Infrastructure and Development (2015) all recommend the installation of solar hot-water systems or heat pumps to ensure energy efficiency regarding heating water for the household. Up to 25-40% of electricity can be saved through the use of solar water heater and while heat pumps do not use solar energy, they use about 33% of the energy of a conventional geyser (CoCT 2012), so making them a much greener option.

3.7.2.2 Efficient use of water

Energy and water share an intricate relationship – every energy source uses water during production (UNDESA 2015). By using energy, water resources are availed to humans for consumption and other uses through pumping, transportation, treatment, and desalination (UNDESA 2015). Water is an increasingly precious, finite and scarce resource which is fundamental to human well-being (Sev 2009; UNDESA 2015). However, freshwater resources are quickly being polluted and depleted worldwide (Li et al. 2010). Water supply can barely manage to keep up with demand, and this will persist since globally water demands doubles approximately every 21 years (Li et al. 2010). According to UNDESA (2015), global water demand (in terms of

withdrawals) is projected to increase by 55% by 2050. By 2025 two thirds of the world's population could be living in water-stressed countries if current consumption patterns continue.

South Africa has long been categorised as a water-stressed country (Otieno & Ochieng 2004) even more so due to the present severe drought conditions (*The Citizen* 2018). It is predicted that by 2025 South African water demands may outstrip supply (Department of Water and Environmental Affairs and Tourism 2009). While the country faces water-demand issues as the population increases, it also faces issues related to water quality (Otieno & Ochieng 2004). According to South Africa (2004) deteriorating water quality is a major obstacle for the country's provision of sufficient quality water to meet its needs and to secure environmental sustainability. The quality of fresh water is decreasing due to increased pollution and urbanisation which results in the destruction of river catchments, wetlands and deforestation. Other human-induced activities such as mining, agriculture, industry and energy use also affect the quality of fresh water (Otieng & Ochieng 2004).

According to UNDESA (2015) water can be a challenge to sustainable development, but if managed in an efficient and equitable manner, water can play a key role in building strong social, economic and environmental systems in the light of rapid and unpredictable changes. Water efficiency is improved by reducing the output and the input (Sev 2009). Through the reduction in use, the amount of waste water is also reduced. Methods to achieve water efficiency include water-wise installations and use of alternative water supplies. Sev (2009) and CoCT (2012) contend that water savings of up to 50% can be achieved by simply installing low-flow devices and water-efficient appliances such as low-flow shower heads, aerators fitted on taps and dual-flush or multi-flush mechanisms (Sev 2009; CoCT 2012).

Due to the limited availability of potable water there has been a rise in the adoption of alternative water supplies. Captured rainwater can be used for domestic and non-potable purposes as it is a renewable resource. The captured water can be used for toilet flushing, cleaning and for watering the gardens (CoCT 2012). Rainwater collected for irrigating the garden considerably reduces the use of potable water (Sev 2009). Boreholes are not regarded as a sustainable alternative to water conservation, but they can assist in reducing the high reliance on potable water, especially for watering gardens (CoCT 2011). Borehole water should be used with care as it plays an important role in the environment. During dry periods, groundwater replenishes low-flowing rivers and during wet periods the opposite occurs with rivers and surface drainage replenishing the groundwater. Therefore, borehole water needs to be managed accordingly to safeguard it from being contaminated or overexploited (CoCT 2011).

It is argued that roughly 30% of water use in residential settings is used for watering gardens (Kibert 2016). The type of land cover present in the surrounding landscape of a building can also impact the amount of water used and thus water efficiency (Askew & McGuirk 2004). Naturally vegetated surfaces are porous that allow increased infiltration into the soil (Guhakurta & Gober 2010), but vegetation is not indigenous plants or lawn they could use excessive amounts of water. Indigenous vegetation is central to water-wise landscaping as they are adapted to the weather of the particular location and consequently require less water (CoCT 2012). Practices such as installing water-wise irrigation systems and mulching can also increase water efficiency.

Xeriscaping,[22] a form of water-wise landscaping has the ability reduce outdoor water use by 50-75% (National Geographic Society 2017). The most important environmental aspect of xeriscaping is the choice of vegetation which is appropriate to the climate. Vegetation that thrives with little added irrigation is called drought-tolerant vegetation. Xeriscaping often means replacing grassy lawns with soil, rocks, mulch and drought-tolerant indigenous plant species. (Malloy et al. 2013).

3.7.2.3 Waste management

Waste management is an essential component of green building (Sev 2009; CoCT 2011). 'Zero waste' in the entire building life cycle (planning, construction, use and maintenance) should be avoided in green buildings (CoCT 2012). Creating waste should be avoided in the first place. If this cannot be achieved, waste should first be reused and then recycled, rather than being sent to landfills. Decisions regarding waste should be made in the design phase as waste should be reduced during the construction and demolition phases (Sev 2009: CoCT 2011). Instead of being dumped, building rubble should be reused. For example, to subgrade driveways. The use of virgin materials should be avoided to save costs and reduce the associated environmental impacts. Provision of areas dedicated specifically for recycling bins, composting, storage space for and access for removal of waste and other facilities should be incorporated in the development (Sev 2009). This will help to manage the waste and facilitate separation at source, thus minimising resource consumption. The endorsement of these various practices all enhances a building's life-cycle and decreases its impact on the environment. The following chapter discusses the adoption of the green building movement in South Africa.

[22] According to the National Geographic Society (2017: s.p.), "xeriscaping is the practice of designing landscapes to reduce or eliminate the need for irrigation. This means xeriscaped landscapes need little or no water beyond what the natural climate provides."

3.8 GREEN BUILDING IN SOUTH AFRICA

The green building movement in South Africa took off in 2007 at the same time as when the Green Building Council of South Africa (GBCSA) was launched (King 2016). The number of green buildings certified by GBCSA has risen from one in 2009 to 193 in 2016 (World Green Building Trends 2016). South Africa has the highest green building share, trumping countries like the United Kingdom, USA, China, Singapore, Germany and Australia (World Green Building Trends 2016). The document reported that the main trigger for green building according to 40% of the South African respondents, was that it's the "[r]ight thing to do" (World Green Building Trends 2016: 49). The next most important causes were client demands (37%) and market demands (29%) which suggest that there is an increased understanding in the South African construction market of the value of green buildings.

The country's green building movement has been further spurred on by rising energy and water costs, the importance of reducing energy and water consumption, electricity shortages, building regulations, natural resource protection and the imminent Carbon Tax (King 2016; World Green Building Trends 2016). This has not only pushed developers and architects to move towards the 'greening' of buildings, but individuals have also started to look for energy-efficient and other green solutions when purchasing or building (*Real Estate Magazine* 2014). Gunnell (2009) had earlier pointed out that awareness in South Africa regarding green buildings had increased due to the rising worldwide awareness of climate change and the demand by international organisations operating in South Africa.

Much of the greening of the built environment in South Africa has occurred in the commercial property sector so that the next phase of environmentally sustainable buildings has been earmarked for the housing market (King 2016; Mahlaka 2016; World Green Building Trends 2016). The move to greening the housing market is conducted using the excellence in design for greater efficiencies (EDGE) rating tool of GBCSA launched in 2014 for new houses being designed and built. According to the World Green Building Trends (2016) report about 31% of South African respondents expect to do new green low-rise residential projects, roughly on par for the global average of 27%. While green building is already relatively established in South Africa, there are some challenges current and future projects must face. The lack of public awareness is the chief barrier limiting the growth of green building in South Africa according to World Green Building Trends (2016), followed by higher first costs, lack of trained green professionals and lack of political support and incentives. A further challenge is experienced in the green building movement is that organisations and developers are liable to abuse the 'going green' trend as an

opportunity to employ questionable tactics to increase their competiveness in the market (Mitchell & Ramey 2011). Greenwashing has emerged to be one such tactic.

Building environmental assessment techniques[23] were developed in a response to counteract greenwashing of building performance (Cole 2005; CoCT 2012). Globally and in South Africa various certification and assessment techniques have been developed to standardise green building practices and to provide a measure of efficiency of the techniques (Gunnell 2009). Green Star, launched in 2002 by the Green Building Council of Australia, has been adapted to South Africa and is used as Green Star South Africa (King 2016). The sustainable building assessment tool (SBAT) was developed in South Africa and incorporates social, economic and environmental impacts of the built environment (Gunnel 2009). The main difference between the various national assessment techniques is the weight given to the different environmental categories. This is highly dependent on the social and economic issues in a region, resulting in rating systems tailored to account for climate and local culture (Cole 2005; Haapio 2012). Cole (2005), Ding (2008) and Haapio (2012) hence argue that importing one assessment method from one circumstance to another or from one region to another or even developing a universally applicable method, are increasingly problematic.

Another problem arising from the adoption of assessment methods is competitive advantage. With green building practices increasing in popularity, developers need to set their developments apart from other green properties (Eerikäinen & Sarasoja 2013). However, property is business. If certification is achieved it brings publicity and exposure for the developer (Rivera 2009). Therefore, Haapio (2012) has questioned whether developers, investors and authorities are truly interested in sustainable building and development or purely in profiling and benefitting from the certification. Sherriff-Shüping (2015) maintains that eco-estates employ greenwashing methods to attract potential buyers, like those who are keen on preserving the environment. Similarly, in reviewing the marketing material of South African eco-estates Baigrie & Ernstson (2017) concluded that certain eco-estates exploit green arguments of sustainability in their sales pitches. This raises the question: who benefits from eco-estates?

3.9 GATED NATURE AND 'ECO' FOR WHO?

Eco-estates which use greenwashing have been criticised for reproducing spaces just as the apartheid-era Group Areas Act once did (Baigrie & Ernstson 2017). By comparison, traditional

[23] Building environmental assessment techniques include the terms 'method' and 'tool', while the terms 'certification', 'rating' or 'labelling' are used interchangeably to indicate extended outputs from the assessment process (Cole 2005).

gated communities create a social exclusion of the wealthy classes by preventing citizens from outside the gates or walls from accessing various resources which were once publicly accessible (Atkinson 2006; Roitman 2010; Spocter 2013). Ballard & Jones (2011) have called these exclusionary spaces 'geographical escapism' – a highly selective interaction with the surroundings.

The physical barriers estates erect through gates, walls and fencing excludes not only those beyond the walls, but also those living behind the walls from the harsh realities outside the walls. The insiders are cordoned off from a wider social geography as Caprotti et al. (2015) has described apartments in Tianjin eco-city. The same could inherently apply to eco-estates which he describes "…as containers of sanitised, 'green' form of living, in which the outlying environmental hazards (air pollution, non-potable water) have little to no effect on the [inhabitants of the estate]" (Caprotti et al. 2015: 510). Caprotti et al. (2015) have argued that the eco-ness created through the development is not for the environment, but instead for its inhabitants. The inhabitants are able to afford to insulate (purchase property) themselves from the environmental externalities beyond the walls. Moreover, owing to the use of greenwashing, residents are made to believe that they are contributing to environmental stewardship and thus they can ignore the wider reality at their ease (Baigrie & Ernstson 2017). Spocter (2013) reported that these exclusive developments restrict human access but they maintain plant and animal access for fauna and flora to thrive, mainly for the purpose of enjoyment by the residents.

While the gating of nature creates social inequalities, developments also maintain green areas which may have otherwise been blanketed in impervious surfaces associated with housing, roads and other built infrastructure (Schäffler et al. 2013). This creates a paradox in terms of South Africa's policy preference for density, while still supporting the development of green spaces (Schäffler et al. 2013). This begs the fundamental question whether or not eco-estates could be an alternative, sustainable form of development.

The emphasis on how sustainability can increase profitability or add value to a company (Cock 2011) is relevant. Therefore, the commodification of nature is being steered by the sustainability discourse. Commodification of nature – the conversion of natural resources into commodities – is being appropriated[24] at an accelerating rate by a wide range of players for various uses in the name of 'sustainability', 'conservation' or 'green' values (Fairhead et al. 2012). Castree (2003) has

[24] "Appropriation implies the transfer of ownership, use rights and control over resources that were once publicly or privately owned – or not even the subject of ownership – from the poor (or everyone including the poor) into the hands of the powerful" (Fairhead et al. 2012: 238).

disclosed that commodification involves multiple elements, including, privatisation, alienation, individuation, abstraction, valuation and displacement.

This practice of attaching a price to nature's services, assigning property rights and trading these services within a global market has been widely accepted as a means to protect the environment (Liverman 2004). However, the practice has been criticised for producing several negative outcomes in a wide range of contexts instead of protecting the environment (Castree 2003; Fairhead et al. 2012; McKirdy 2016). The critiques of the commodification of nature have resulted in three broad problem areas. Practical problems include whether or not nature can be properly made into a commodity (Castree 2003); moral problems include the ethical implications of commodification (Liverman 2004); and consequential problems include the effects of commodification on nature itself (Castree 2003).

Cock (2011: 45) maintains that "[c]apital's response to the ecological crisis is that the system can continue to expand by creating a new 'sustainable' or 'green capitalism', bringing the efficiency of the market to bear on nature and its reproduction." Green capitalism rests on two pillars: technological innovation and expanding markets. It specifically involves the following: appeals to nature as a marketing tool; developing largely untested clean coal technology through carbon capture and storage; the development of new sources of energy, thereby creating new markets; the massive development of biofuels; and the carbon trading regime enshrined in the Kyoto Protocols (Cock 2011). If capitalism continues, unbearable climatic conditions can be expected along with an intensification of social and ecological crises (Cock 2011).

Regarding the eco-estates, the quality of life that eco-estates offer, along with the nature they contend is being 'conserved', are assigned a market value to invite affluent urban residents to purchase "…a reconnection with land" (Swart 2008: 24). Therefore, while the ecological crises accelerate, at least in the short run, the dominant classes will survive, living in protected enclaves in what Foster (2009) calls a fortress world. Foster (2009: 260) intones that: "Fortress World is a planetary apartheid system, gated and maintained by force, in which the gap between global rich and global poor constantly widens and the differential access to environmental resources and amenities increases sharply. It consists of bubbles of privilege amidst oceans of misery." Developers have commodified nature an element which is rightfully accessible by all, and they have changed it into another form with a specific price attached.

3.10 CONCLUSION

This literature review spotlighted the phenomenon of gated communities. It has established that there is no universally accepted definition of a gated community. Definitions of a gated community are largely dependent on current contexts and motivations for a development. Consequently, the contexts, drivers and motivations of gated communities have resulted in various types and have also influenced the various definitions of gated communities. Notwithstanding this diversity, safety has always been a core characteristic of all types of gated communities around the world, including South Africa.

With safety, security and privacy being core factors leading the development of gated communities, they have recreated spaces just as the apartheid-era Group Areas Act once did. These developments have produced exclusive and exclusionary spaces which have affected city planning, and thus sustainable development. The absence of an agreed definition of the phenomenon has led to a lack of regulations for the design of gated communities. Therefore, developers have much freedom to design these developments as they wish, thereby adversely impacting on spatial planning and the development of sustainable settlements in South Africa.

The sustainability of gated communities concerning environmental, social and economic pillars was discussed. Due to the various environmental impacts of gated communities and the demand for being close to nature, there has been an evolution of lifestyle estates. This has led to the emergence of what is known in South Africa as eco-estates. Eco-estates are an alternative growth strategy in response to the environmental impacts of conventional development. However, like gated communities, eco-estates do not have a universally accepted definition. Given the difficulties of definition the term is used broadly but the lack of a suitable definition has impacted on the application and practices of eco-estates.

A key thread emerging from the literature is that the sustainability paradigm has largely influenced the emergence of eco-estates, the way buildings in general are being constructed and the allocation of resources. This has influenced developer's decisions and has spurred on the development of eco-developments and green buildings. Once again no universally accepted definition of green building is available, thus creating ambiguity in its application. Eco-developments seen as products of ecological modernisation. Owing to the competition in this sector, developers adopt greenwashing tactics just to get approval for developments. Furthermore, the sustainability discourse has driven the commodification of nature on which eco-estate developers capitalise on in the name of 'conserving' and being 'sustainable'. This raises concerns about who the 'eco-ness' created by these developments is aimed at and whether or not the ecological benefits produced by

these estates extend across landscapes. Therefore, discussion now turns to the locational aspects of eco-estates in South Africa.

CHAPTER 4 THE LOCATION OF ECO-ESTATES IN SOUTH AFRICA

4.1 INTRODUCTION

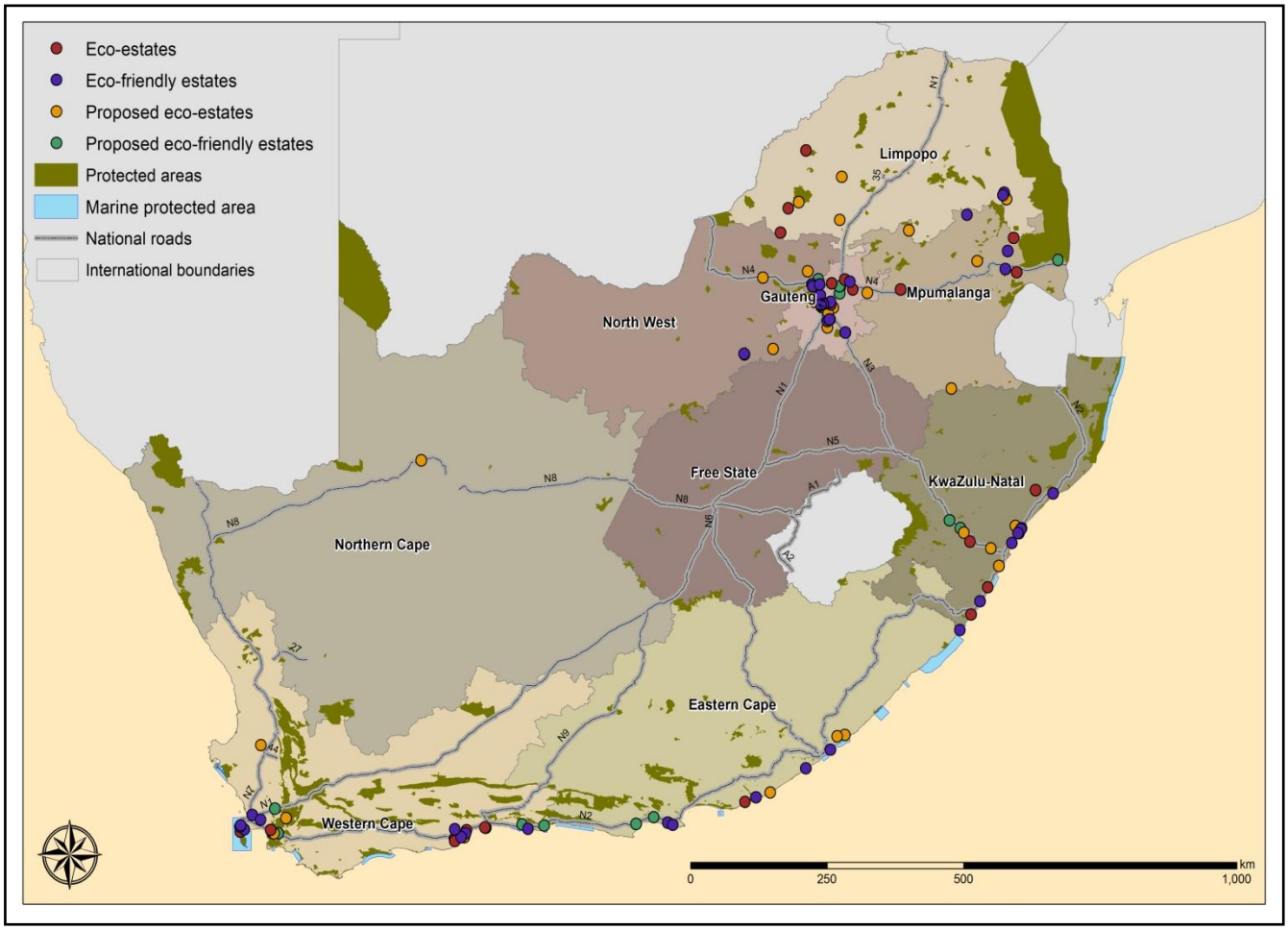
This chapter addresses Objective 2 to undertake a locational analysis of eco-estates in South Africa and Objective 3 to determine if the location of eco-estates and eco-friendly estates are contiguous with existing conservation areas. The purpose of eco-estates is to incorporate development and land protection at a landscape level. As such, these developments aim to provide ecological benefits, not only within the boundaries of each development, but beyond the borders to extend and buffer protected areas and maintain ecological connectivity across landscapes (Arendt 2004; Milder 2007; Carter 2009; Freeman & Bell 2011). Eco-estates require large, unspoilt areas to achieve this, usually outside the city (Hello House 2016).

However, in South Africa this choice of location has constantly been criticised as unsustainable and as a problematic pattern of urban development (Department of Environmental Affairs and Development Planning 2005; Spocter 2011; Landman & Badenhorst 2012; Department of Environmental Affairs 2016; Bagrie & Ernstson 2017). Thus, it becomes important to analyse whether or not the location of eco-estates in South Africa contributes ecological benefits in relation to the larger landscape of the country. The chapter begins with an overview of the national picture of eco-estates and eco-friendly estates in South Africa. It then moves to specific details of the estates in each province. Thereafter, promotional descriptions are given of each estate involved in the online questionnaire, followed by an analysis of the responses of the participating managers and developers.

4.2 THE NATIONAL PICTURE

The creation of a database for eco-estates and eco-friendly estates in South Africa, enabled the researcher to portray a national picture of the eco-estate phenomenon. An internet search, using Google and Sabinet Media, was conducted to identify the country's eco-estates and eco-friendly estates. The keywords 'eco-estate', 'eco-friendly estate' 'eco-estate and green building', 'green living', 'sustainable estate' and 'green estate' were used in the search. Extant South African studies were consulted to add to the list of estates. Only established estates were selected, while those still in their planning or very early developing stages were categorised as 'proposed estates'. The eco-estate phenomenon has grown in numbers across South Africa. Koblitz (2006) recorded close to 50 developments that term themselves as eco-developments in one way or the other. This study has found a total of 113 such estates across South Africa – this includes eco-estates, eco-friendly

estates and proposed eco-estates and proposed eco-friendly estates. Their location is mapped in Figure 4.1.



Source: Author

Figure 4.1 Spatial distribution of all categories of eco-estates and eco-friendly estates in South Africa in 2018

The distributional pattern of the eco-estates and eco-friendly estates is evident. The features of the pattern include concentration and clustering in and around the metropolitan areas of Cape Town and Johannesburg. There is a dispersed pattern in the northern regions with a concentration near South Africa's premium national park (Kruger National Park). The southern and south-eastern coastlines are characterised with a chain-like spreading of the estates that are also strung along adjacent national roads like the N2, N3 and marine reserves and parks. Figure 4.1 also illustrates the absence of eco-estates and eco-friendly estates in large inland areas. The discussion that follows describes the locational characteristics in each province in relation to other factors which may indicate choice in location.

De Beer (2014) along with *Estate Magazine* (2018), argue that there is a shift in types of estates from the traditional golf estates to developments offering a range of activities or lifestyles, such as

eco-estates (sustainable lifestyle focus, with hikes or trails for walking) and retirement villages (frail care provided on-site). The 113 estates comprises 26 eco-estates, 43 eco-friendly estates, 28 proposed eco-estates and 16 proposed eco-friendly estates. Table 4.1 shows the total numbers and proportions of estates per category, per province in South Africa.

Table 4.1 Eco-estates and eco-friendly estates in South Africa per province

Type of estate	Provinces[1]									Row total and (%) of totals
	EC	FS	GAU	KZN	LIM	MPU	NC	NW	WC	
Eco-estate	1	0	5	5	3	4	0	1	7	26 (23%)
Proposed eco-estate	3	0	5	4	4	4	1	3	4	28 (25%)
Eco-friendly estate	6	0	9	8	5	1	0	4	10	43 (38%)
Proposed eco-friendly estate	1	0	3	4	1	1	0	1	5	16 (14%)
TOTAL	11	0	22	21	13	10	1	9	26	113 (100%)
% of column totals	10%	0%	19%	19%	12%	9%	1%	8%	23%	101%[2]
% Contribution to GDP	8%	5%	35%	16%	7%	7%	2%	6%	14%	100%

[1]Note: EC = Eastern Cape, FS = Free State, GAU = Gauteng, KZN = KwaZulu-Natal, LIM = Limpopo, MPU = Mpumalanga, NC = Northern Cape, NW = North West and WC = Western Cape.

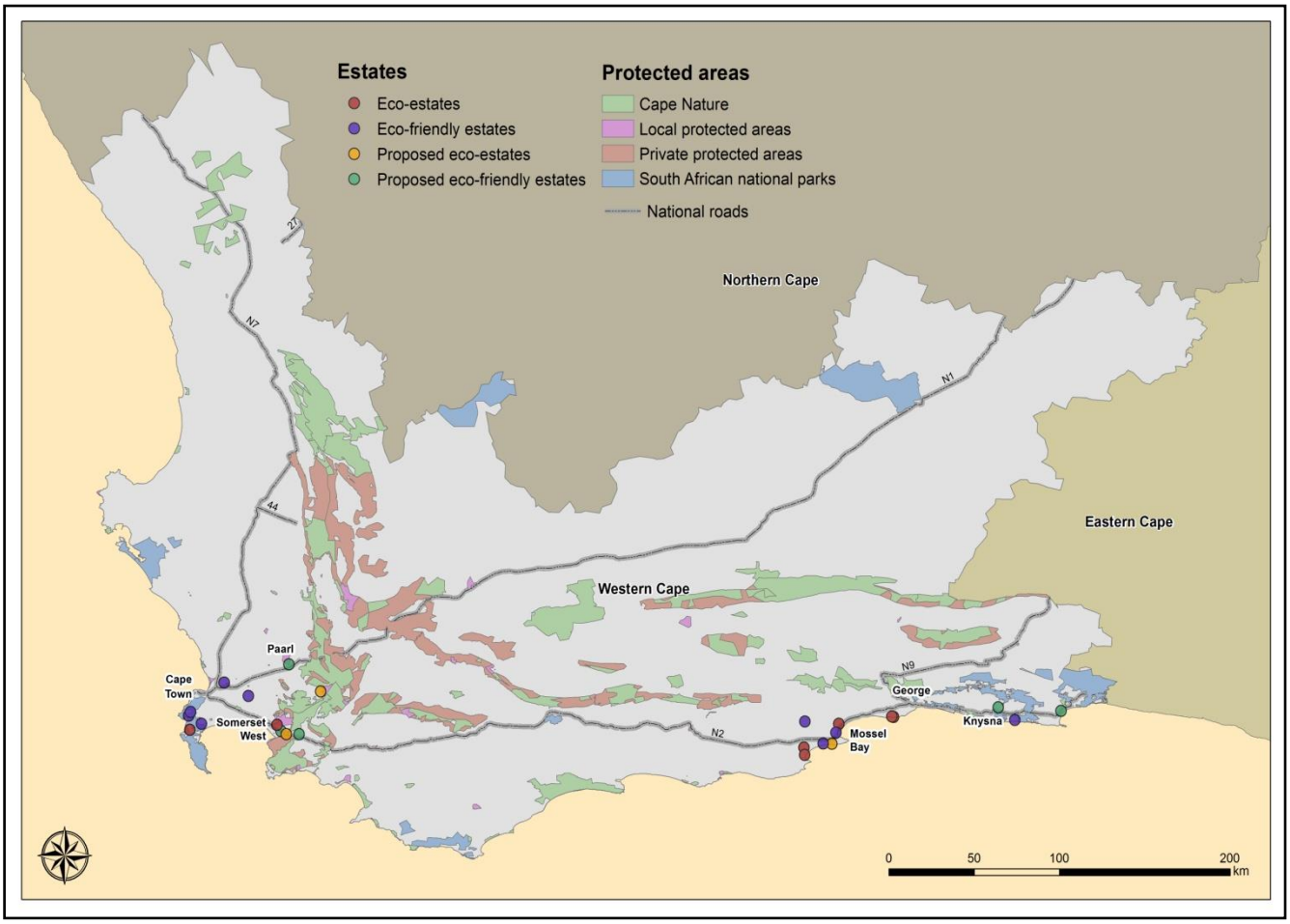
[2]Note: Due to rounding off columns may not add to 100%.

The Western Cape has the greatest total proportion (23%) of all estates in the nine provinces. The Western Cape has the most eco-friendly estates (10), eco-estates (7), proposed eco-friendly estates (5) and four of the 16 proposed eco-estates. The Western Cape is the fourth largest province in

South Africa and has a 90% urbanisation rate (Kok & Collinson 2006; StatsSA 2012). Its capital, Cape Town, is one of the most developed economic hubs of South Africa and the province, contributes some 14% to the gross domestic product (GDP) (StatsSA 2017). There appears to be a relationship between the economic contribution of a province and the number of eco-estates or eco-friendly estates in a province. The higher the economic contribution to the GDP, the more eco-estates or eco-friendly estates are found in the province. Gated communities located near or in major metropolitan areas or business hubs and close to good schooling have been found to be among the most successful (Barbeau 2015). These factors could help to explain why the Western Cape has the most eco-estates and eco-friendly estates.

De Beer (2014) has established that there is a demand for eco-developments which are close to nature, green spaces or the countryside. Since 90% of the Western Cape is urbanised, many residents quite likely are seeking a lifestyle away from the hustle and bustle of urban life and, as Ballard & Jones (2011: 3) argue, a chance to "…reconnect with nature." Moreover, it has been found that urban areas are not the healthiest places in which to live as these areas concentrate health risks and hazards (WHO 2018). This helps to explain the demand for nature-orientated or green estates outside cities by those who can afford them.

Figure 4.2 shows that the estates in the Western Cape are located in Cape Town, in the Boland and along the far southern Cape coastline. Those in Cape Town are situated away, but not far from the city centre on the urban periphery and beyond. The estates located along the coastline are in or near secondary cities and towns such as George and Knysna. Cape Town and its hinterland are characterised by outstanding natural beauty, thus creating a demand for this peri-urban land for recreation and for upper-income housing (Dreyer 2001). The availability of land and access to natural elements enable low-density living and allow a range of facilities and amenities on estates located in these areas (Spocter 2011). This peri-urban land is particularly desirable for developers of eco-estates which require large tracts of land to be successful.



Source: Author

Figure 4.2 Location of all categories of eco-estates and eco-friendly estates in the Western Cape

Seven developers were asked to take part in the survey of this study, but only three acceded and participated. Two of these were developers of eco-estates[25] while one was an eco-friendly estate developer.[26] Eco-developer B and developer A indicated that a greenfield is the preferred development site of eco-estates, while eco-developer A indicated a brownfield[27] site as preferable. Arendt (n.d.) suggests that typically 50% or more of the buildable land should be conserved. This may explain why developers choose to develop eco-estates and eco-friendly estates on the urban periphery and beyond, closer to nature where there is more open space and 'untouched' land available. Such locations enable an estate to fulfil its aim of conserving the original development site as much as possible. This accords with Landman & Badenhorst (2012) contention that 'eco'

[25] Hereafter referred to as eco-developer A and B.

[26] Hereafter referred to as developer A.

[27] A brownfield refers to an area of land that was previously used for factories, offices or industry and where new buildings can be built (*Cambridge Dictionary* 2018).

and 'nature' estates are primarily located on the urban periphery owing to the availability of larger portions of land, proximity to nature and the possibility of including natural elements such as wetlands, streams, paths and rails which enhance the layout of such estates. Unfortunately this does not assure that no damage is done because by building on greenfield sites biodiversity is lost.

The developers gave various reasons for their decision to build on greenfield sites. Developer A stated that a balance of land is required, that is land suitable for development and which can be preserved in its original state. Eco-developer B indicated that "…desirability as a residential location i.e. close to schools, unique setting including dams, open space and views" informs their decision. All three agreed that large, undeveloped open space sets eco-estates apart from other types of gated communities. Only eco-developer B added that conservation goals and the integration of flora and fauna also differentiates this type of development from others. Although South Africa has a policy preference for urban infill and compaction (Schäffler et al. 2013), infill or brownfield areas are not the most suitable locales for the development of eco-estates or eco-friendly estates.

This is conceivably the reason why appeals against eco-estates are continually being made by local communities, NGOs and governmental organisations. The most common claims relate to the location of eco-estates and eco-friendly estates on and beyond the urban edge (Gosling 2013) where there is more space. Also, developments which are proposed on the most environmentally sensitive land quickly raise concern and are appealed against (*Daily Dispatch* 2006; Bega 2008; 2012). Von Geusau's (2017) thesis on the contributions of eco-development to urban performance and sustainability found that the eco-friendly estate in her case study in Cape Town was opposed by civic and environmental groups. The primary concerns expressed by the public was that access to natural open space is hindered and heritage concerns regarding the entrance to the estate she studied. Environmental groups and the public also voiced concerns over the location of the estate on the urban edge.

The need for space is a likely explanation why most of the Western Cape's proposed eco-estates and eco-friendly estates in this study are to be located away from Cape Town and in surrounding smaller towns. Furthermore, as Lantitsou (2017) argues, eco-developments aim to strengthen medium and small urban centres to avoid overconcentration in urban centres. There is one proposed eco-friendly estate which is far from the rest of the clusters in the province where it will be nestled between the slopes of the Piketberg. The rural town, Piketberg is characterised by wide open spaces and thus home to breath-taking scenery (Piketberg Tourism n.d.). This location is indeed be attractive to developers of eco-estates and eco-friendly estates.

A proposed eco-friendly estate will be in the Cape Winelands in Paarl in the middle of a natural forest overlooking the Paarl Valley. Paarl is a popular tourist destination. The Cape Winelands is known as one of the 'pearls' of South Africa's rural and small-town subregions (Cape Winelands District n.d.). The backdrop combination of vineyards and mountains is highly sought after for eco-developments.

One proposed eco-friendly estate and one proposed eco-estate will be situated in Somerset West, while the remaining eco-estate is situated in Grabouw. The established eco-estates and eco-friendly estates in Cape Metropolitan area are in Hout Bay, Noordhoek, Westlake and Kuils River. Hout Bay is known as the 'heart of the Cape' as it is situated almost halfway between Cape Town and Cape Point. It is a popular seaside resort town recognised as one of South Africa's leading destinations, for international and for local tourists alike (Hout Bay Organised n.d.). Hout Bay has retained a rural atmosphere and is therefore sought after by migrants from Gauteng and KwaZulu Natal and, of course, by international buyers (Mercer 2017).

The coastal suburb of Noordhoek is also popular among tourists and locals for its rural village-like atmosphere and is known as one of Cape Town's 'most treasured destinations' (Noordhoek Tourism 2017). Located on the western side of Silvermine Nature Reserve the area boasts a blend of beach, mountains, sea and nature. According to Guyot et al. (2015: 16) the areas of Noordhoek and Hout Bay take advantage of their rurality "…to maintain property prices high, linked to an unequalled quality of life in the [Cape] Peninsula, thanks to existing natural amenities." These natural amenities and landscapes influence the names chosen for the estates in the area such as 'Boskloof' (forest gulf) and 'Woodlands' (Guyot et al. 2015; Spocter 2018).

Clusters of estates occur along the renowned Garden Route. The Garden Route includes popular tourist towns and secondary cities such as Mossel Bay, Knysna, George, Plettenberg Bay, Sedgefield, Wilderness and Groot Brakrivier. In his study on the spatio-temporal aspects of gated residential estates in non-metropolitan areas in the Western Cape (Spocter 2011), found many gated communities along the Garden Route. He also established that proximity to the metropolitan area or coast is an important factor in the location of gated communities. The Garden Route is popular among tourists and locals for its scenic stretch of the south-east coast of South Africa. It includes one of South Africa's richest botanical treasures and forms part of the Cape Floral Heritage Site. Of all the towns along the Garden Route, Mossel Bay has a total of five eco-estates and eco-friendly estates, including a proposed eco-estate, two eco-estates in Boggomsbaai, two eco-estates in George, one eco-friendly estate in Knysna, including a proposed eco-friendly estate and one proposed eco-friendly estate in Plettenberg Bay.

Coastal locations are also apparent in KwaZulu-Natal (KZN) and the Eastern Cape (Figure 4.1). According to Hoogendoorn & Visser (2010) towns and villages along South Africa's coastline and interior have grown significantly due to the presence of second-home developments. Traditionally second-homes were not mainstream. Instead the idea was to live closer to the workplace in order to reduce commute times to improve quality of life, but to sometimes sacrifice quality of location (BusinessTech 2018). However, today, the idea of being close to nature and enjoying the attractions that the coast has to offer in a secured environment has become an appealing lifestyle choice (*Estate Magazine 2018*), especially since cities are becoming more and more congested. The semigration trend apparent in South Africa has increased property prices along the coast in the Western Cape and KZN, thus contributing to second-home development (*Estate Magazine* 2018).

Furthermore, owners of second-homes have been found to mostly be upper-level income earners (Hoogendoorn & Visser 2010). This suggests that homes in eco-estates and eco-friendly estates are potentially second homes and since they are located outside of the cities, and aimed at a class able to afford this 'urban-escape' lifestyle. The findings of research conducted by Lightstone Properties on community and estate living in South Africa in 2010 gives support to this notion, namely the estimated total value of the residential properties in gated communities is R643 billion (Davids 2015). "This figure equates to an average value of more than R2 million per home which is significantly higher than the national average of R884 000 per home" (Du Toit 2015 cited in Sherriff 2015: 60). Moreover, according to *Estate Magazine* (2018) and Mockrin et al. (2017) coastal property will always have a price premium as there is a limited supply with unique elements which cannot be substituted.

Clearly, eco-estates can be financially advantageous to developers, but at a cost to nature. Midler (2007) has found evidence that the profit motive of developers drives the development of eco-estates. This points directly to the commodification of nature. It is clear that only those who are classed as wealthy can afford to live in these kinds of estates. Moreover, as Beuschel & Rudel (2010) found whereas developers may contribute towards preserving open space and biodiversity, they build the largest homes, thus damaging the environment the most.

The estates in KZN are located in or near small towns on the coastline, adjacent to the N2 and N3 national roads so allowing easy access to the province's major cities Durban and Pietermaritzburg. KZN is the third smallest province in South Africa and one of the least urbanised at 45% (Kok & Collinson 2006). It is understandable why the province is often referred to as 'South Africa's garden province' for its lush and well-watered hills and valleys (Kiryowa & Oleny 2016). While

the province may be small in size, it is the second biggest contributor (16%) to the national economy (StatsSA 2017). KZN has the third most estates (21%) or 18% of all the recorded cases (Table 4.1). There are more eco-friendly estates (eight) than eco-estates (five).

The coastal towns in which KZN's estates are located include popular international and local tourist and holiday towns Pennington, Hibberdene, Port Edward, Ballito, Shelley Beach and Mtunzini. The holiday town Ballito has the most (seven) estates in KZN. Of which two are proposed eco-estates, four eco-friendly estates and one eco-estate. Farther inland, adjacent to the N3 major route is one proposed eco-estate and two proposed eco-friendly estate as shown in Figure 4.1 and with one eco-estate situated near Pietermaritzburg. Pietermaritzburg is the capital and second largest city in KZN and is home to some premier schools. A little farther along the N3 is the small town of Hilton where a proposed eco-estate is to be located. The area hosts Hilton College, one of the top schools in South Africa (Africa Alamanac 2004). The connection between these estate locations and the presence of good schools is evident. Buyers who can afford to live in these estates are no doubt able to afford the school fees set by top private schools. Ramsawmy (2017) and Ingle (2013) both found that the availability of good schools in surrounding rural areas incentivises parents to invest in estates in these areas. Even farther inland are two eco-friendly estates to be located in the KZN Midlands. The Midlands Meander is a collection of tourist destinations or routes that enjoy the natural beauty and hospitality the area has to offer, thus making the area greatly sought after by developers and buyers.

The Eastern Cape's estates are all located along the coastline (Figure 4.1). The province is the second largest in South Africa, yet it is one of the least urbanised (38%) (StatsSA 2012) and it is the fourth largest (8%) contributor to the national economy (StatsSA 2017). The Eastern Cape has a total of 12 (11%) estates (Table 4.1). From the economic contributions of the three provinces which have been discussed it appears that that there is a direct relationship between the more economically productive provinces and the number of eco-developments. The more economic opportunities in these areas create demand for the secure housing catered for in gated communities.

The Eastern Cape has only one eco-estate, but six eco-friendly estates, although there appears to be growing interest in this development type given the three proposed eco-estates and one proposed eco-friendly estate. The single eco-estate in the province is located in the small coastal town Kenton-on-Sea on the Sunshine Coast between the province's two major cities Port Elizabeth and East London. Kenton-on-Sea is a popular holiday destination which is easily accessible from Port Elizabeth and East London via R72 and is thus a prime location for eco-developments.

Of the six eco-friendly estates in the Eastern Cape (refer to Table 4.1), two are located in Port Elizabeth along the coast, one in Jeffreys Bay (a popular coastal tourist town), one in Port Alfred (another small coastal town) and two in East London. The only proposed eco-friendly estate will be located in Thornhill, a town situated just outside Port Elizabeth, but still forms part of the Nelson Mandela Bay municipal area. The three proposed eco-estates are to be located along the province's coastline. The evidence is mounting that eco-estates and eco-friendly estates are prevalent features along South Africa's coastlines, especially in popular, small holiday towns.

This location of the estates in small towns or secondary cities on the coastlines in the Western Cape, KZN and Eastern Cape reveals that these estates are not necessarily close to the city centres of each of these provinces. Figure 4.1 confirms that the estates in the southern region of the Western Cape and the Eastern Cape and those in KZN are located adjacent to major transport routes. This suggests that many of the residents of these estates are increasingly auto-dependent. This, in turn, has a range of adverse environmental implications like increased traffic congestion which affects air quality due to increased emissions of CO_2 (Landman & Du Plessis 2007), decreased opportunities for sustainable public transport (Landman 2004); and called-for upgrading in infrastructure leading to increased pollution and loss of natural capital.

The closeness to national roads, city centres, amenities, recreational and other opportunities is persuasively advertised on the estate websites along with the assurance of security in the estates. Unfortunately this has little to do with the 'eco-ness' of such estates. Sherriff-Shüping's (2015) study of the sustainability of eco-estates in Gauteng also found that the naming or branding of estates may suggest the environment as a priority, however the opposite occurs where security remains a foremost priority. This calls into question the concept of 'eco-living' and the sustainability of these developments. Perhaps the sense of eco-ness is only present behind the walls of these developments and not beyond. Hodson & Marvin (2010) contended that these developments should be seen as attempts to create neo-liberalised environmental security, not at a city or global scale, but ecological security for elites. The eco-ness created within such developments is not for the environment, but for its inhabitants. Regarding eco-estates in Durban Ballard & Jones (2011: 144) argue that "[i]n more than one way, these developments naturalise inequality and exclusion."

Therefore, it is questionable whether eco-urbanism models like eco-estates actually assist in developing fair and just cities which are in harmony with nature. Unlike the wealthier classes, who are able to insulate themselves in a green sanitised space from the harsh realities beyond the walls of the development, those at the bottom of the socio-economic ladder do not have the power to

avoid the consequences of environmental issues such as polluting industries, power generation and poor distribution of essential facilities (Agyeman, Ballard & Evans 2002). These are compounded by the fact that the poor are not the major polluters. Just sustainability recognises that this human inequality is bad for environmental quality (Agyeman, Ballard & Evans 2002). Therefore, sustainability cannot only focus on 'green' or environmental concerns and cannot continue to be based only on intergenerational equity, but focus is required on intra-generational equity (Agyeman 2008). Just sustainability demands that justice and equity take centre stage in sustainability models.

The Northern Cape has only one proposed eco-estate which is to be located adjacent to the N8 in Upington. The absence of estates in the Northern Cape is quite likely attributable to the province being the least populated of the country's provinces (StatsSA 2012). While the province is the largest in South Africa, it makes the smallest (2%) contribution to the national economy (StatsSA 2017). No estates were found in the Free State. Ferreira & Visser's (2015) spatial analysis of gating in Bloemfontein, found that there were only a few gated communities comprising of large open space areas for the occupants. However, none of these estates qualified for the selection[28] in this study.

The Free State, like the Northern Cape, makes a very small contribution to the national economy (5%) (StatsSA 2017). Furthermore, the Free State is known as the breadbasket of South Africa – with over 70% of the country's grain being produced in the province (Fongwa et al. 2014). The province is characterised by vast open plains which are rich and fertile. This may explain why there are so few gated communities such as eco-estates occupying large open spaces. However, Spocter (2013) has pointed out that in the Western Cape there has been a shift to combine and diversify land uses, where agriculture and gated communities co-exist in a post-productivist mix.

The Free State could adopt a similar process in the form of eco-estates. Pejchar et al. (2007) believe that eco-estates can be designed in a way that protects agriculture lands, whereas others are adamant that eco-estates should prohibit any kind of agricultural activity to be truly known as eco-estates (Koblitz 2006; Elaleni Coastal Estate 2016). Again, this alludes to a very 'selective sustainability' produced by these estates. Essentially, the move should be toward establishing

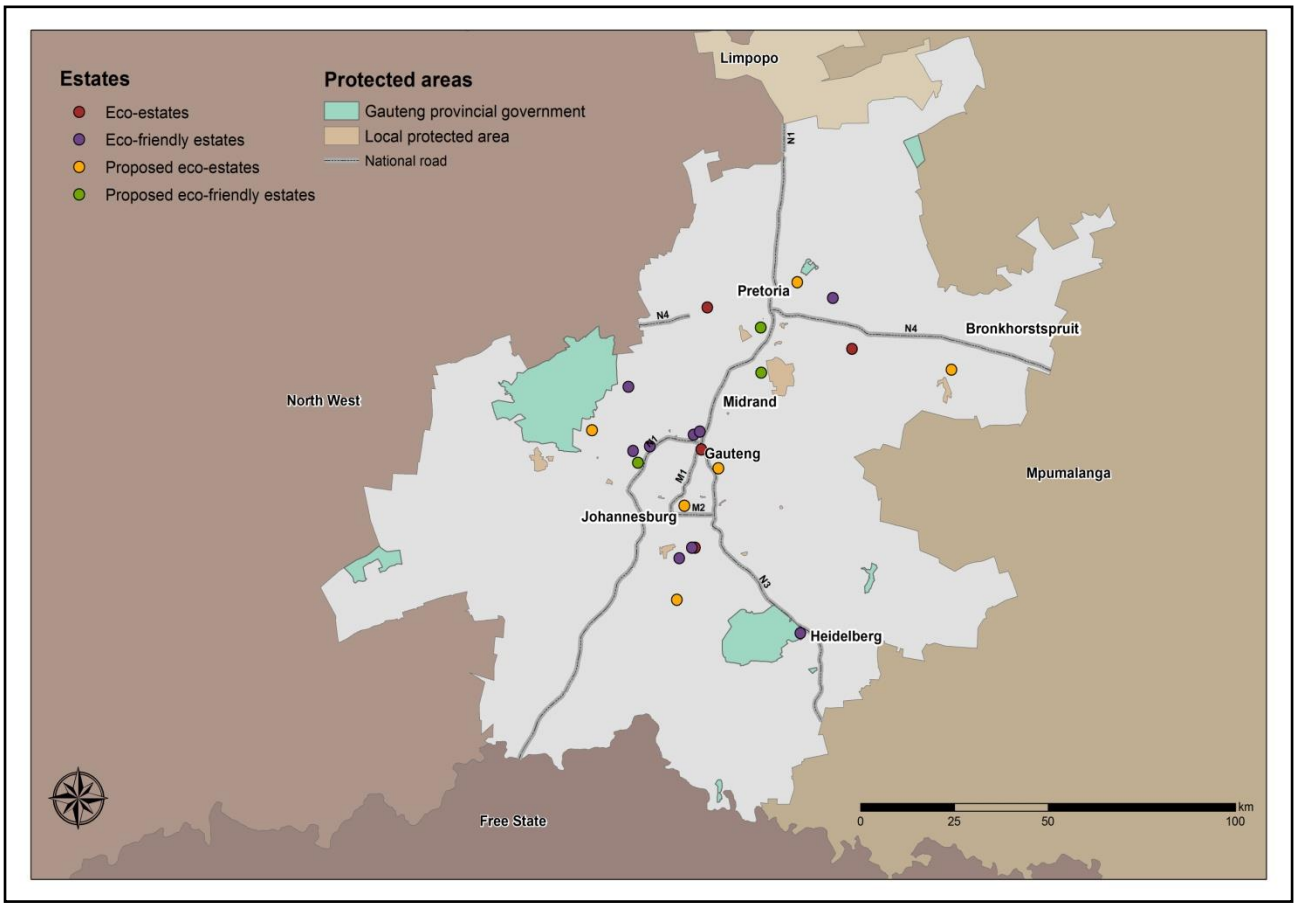
[28] Marketing terms such as 'eco-estate', 'eco-friendly', 'sustainability', 'sustainable development', 'green building', 'green living', 'green development', 'conservation', 'energy-efficiency', 'water saving' or any similar terms, were looked for on estate websites and in other marketing material. It should be noted that the information on these websites is continuously changing thus affecting the original selection process that took place.

developments which are self-sufficient, including the growing food crops. Given that gated communities are repeatedly being criticised for infringing the availability of high-potential agricultural land (Department of Environmental Affairs and Development Planning 2005; Spocter 2011; Landman & Badenhorst 2012; Department of Environmental Affairs 2016) – diverse land uses may be a viable option.

North West province, just like Northern Cape and Free State, has very few (only nine) estates (8% of total) (Table 4.1). North West is one of the least urbanised (41%) provinces in South Africa (Kok & Collinson 2006) and the third smallest contributor to the national economy (6%). While there is currently only one eco-estate in the province, there are four proposed developments. Limpopo and Mpumalanga also have more proposed eco-estates than established ones. The two provinces also contribute little to the national economy; that is 7% each (StatsSA 2017). The provinces which have the most eco-estates and eco-friendly estates have the metropolitan hubs of South Africa where there are job opportunities and other lifestyle needs which attract potential buyers as in the case of coastal properties.

Gauteng is the prime contributor to the national economy (35%) (StatsSA 2017), the country's smallest province only 1.4% of the land area of the country and the most (96%) urbanised (StatsSA 2012). Given this it is not surprising that it has the second most estates of all provinces (Table 4.1). Again, an indication of the desired relationship between economic contribution and the prevalence of eco-estates. As the main economic hub of South Africa with many job opportunities it attracts both developers and buyers of eco-estates. The spatial distribution of the five eco-estates, nine eco-friendly estates, five proposed eco-estates and three proposed eco-friendly estates is shown in Figure 4.3. Most (74%) of the estates in the Gauteng province are located in Johannesburg and Pretoria, the two metropolitan municipalities of the province.

The estates are located as in the Western Cape, away from the city centres and dispersed instead of forming clusters. The only prominent clusters are in Johannesburg South and Midrand. Johannesburg South is a node that is easily accessible. Midrand is situated halfway between Johannesburg and Pretoria which is a sought-after location for housing developments. Midrand is close to the economic hub of Sandton. There is an eco-friendly estate in Heidelberg adjacent to the N3 national road between Johannesburg and Durban. A proposed eco-estate is to be located Bronkhorstspruit near the Gauteng-Mpumalanga border.



Source: Author

Figure 4.3 Location of all categories of eco-estates and eco-friendly estates in Gauteng

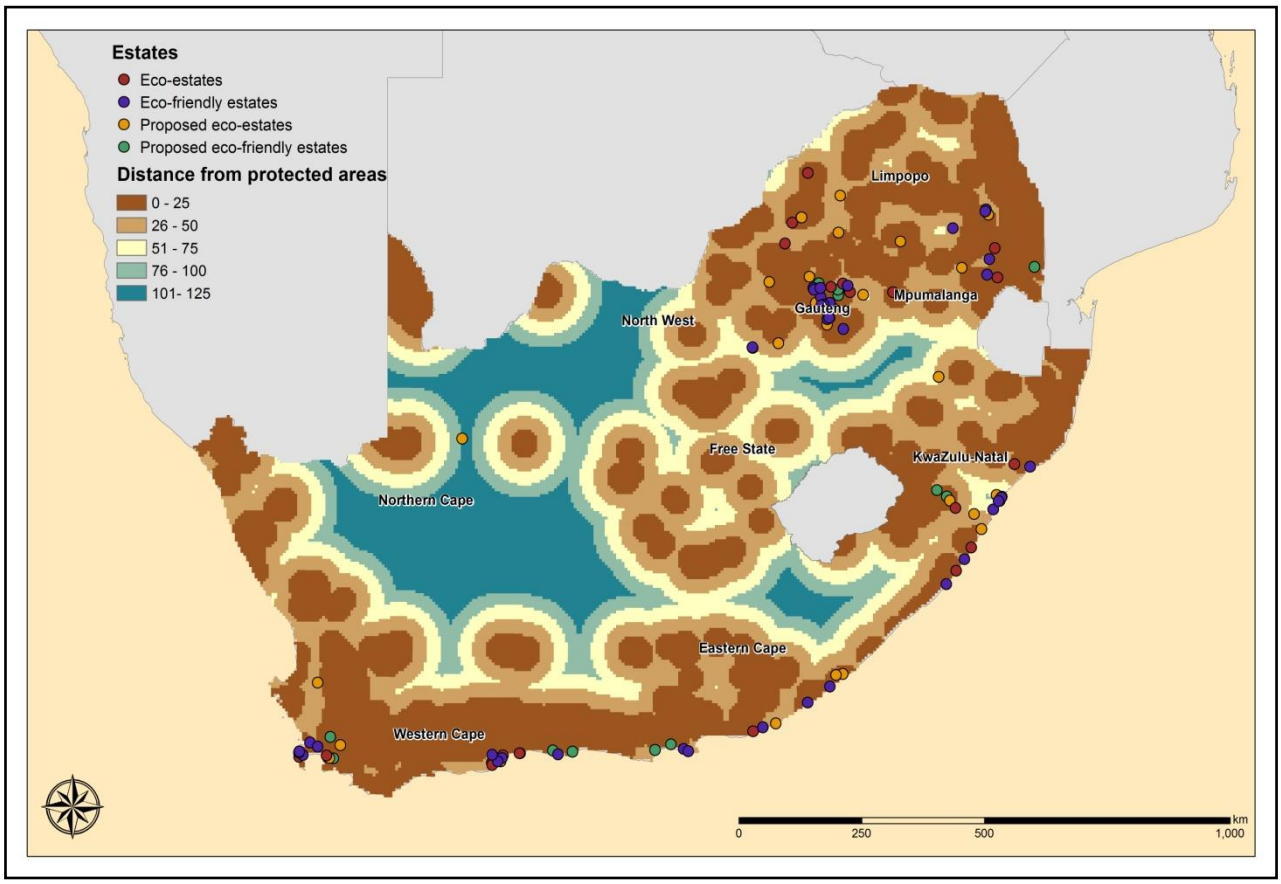
Towards Magaliesburg, a popular local getaway, a proposed estate will be located near the border between North West and Gauteng provinces. The location of the estates in Gauteng seems to be in areas which are accessible by surrounding provinces like Mpumalanga. Semigration and second-home developments probably could be influencing this trend. Furthermore, according to Landman & Badenhorst (2012) the amount of undeveloped land in the central Johannesburg areas is very limited. This probably explains why the proposed estates are to be located even farther away from the cities because they require ample space to be successful. Their success depends on whether or not they are able to protect green infrastructure, provide habitat refugia, maintain landscape connectivity and buffer nature reserves or other eco-estates to establish linked networks of open space (Arendt 2004; Milder 2007). This means that eco-estates should be providing ecological benefits beyond their walls and boundaries for the greater landscape at a local and regional levels. This is taken up next.

4.3 ECO-NEIGHBOURS?

It may seem as if eco-estates do not play the social sustainability card at all. However, they have emerged as a tool to combine development and conservation in a way which has the least impact on the natural environment. Furthermore, it is envisioned that these developments will enhance land protection, preserve ecosystem services and extend protected public lands (Milder 2007; Carter 2009; Freeman & Bell 2011). Conservation of natural qualities and resources is a key theme of sustainability (Porter 2012), therefore it becomes important to examine whether or not eco-estates are protecting and conserving land for future generations.

While South Africa ranks as the third-most biologically diverse country in the world, it is rapidly losing this diverse biological wealth. The most recent assessment of the nation's biological resources indicates that 40% of terrestrial ecosystems, 57% of river ecosystems, 65% of wetland ecosystems, 43% of estuary ecosystems and 58% of coastal and inshore ecosystem types are threatened (Driver et al. 2012). Protected areas are indeed one of the cornerstones for maintaining a healthy environment for people and nature (UNEP-WCMC & IUCN 2016), however, they are inadequate (Rodrigues et al. 2004). Because eco-estates and eco-friendly estates are becoming increasingly popular across in South Africa, with 39% proposed developments (Table 4.1) already underway, it is imperative to examine whether the established developments (61%) are fulfilling their full potential. If not, future developments must implement the necessary changes. Figure 4.4 illustrates the location of all the estates in relation to their distance from various types of protected areas in South Africa.

The protected areas are national parks, mountain catchment area (MCAs), marine protected area (MPAs), forest protected areas, local nature reserves, provincial nature reserves, special nature reserves, World Heritage Sites and one conservation area, the National Botanical Gardens. South Africa's national parks and MPAs are managed by the national government which has agreements with various management authorities like South African National Parks (SANParks), CapeNature, Eastern Cape Parks and Tourism Agency (ECPTA), KZN Wildlife, Nelson Mandela Bay Metro (NMBM) and CoCT (MPA Forum 2018).



Source: Author

Figure 4.4 Distances of all categories of eco-estates and eco-friendly estates from protected areas in South Africa

Public nature reserves are managed by provincial and local governments and the private nature reserves are managed by private landowners. World Heritage Sites are listed by the United Nations Educational, Scientific, and Cultural Organization (UNESCO). South Africa has eight UNESCO heritage sites, each has been given special international status for its unique qualities. Therefore, it is in the interest of the international community to preserve each site.

As can be seen from Figure 4.4 and Appendix B[29] all of the estates in the Western Cape are within 25 km distance from a protected area, except for one proposed eco-estate which is 26.6 km distant. The reason for this overall proximity is that most of the south-western Cape is in the Cape Floral Region. The area contains eight World Heritage Sites and is regarded as one of the world's great centres of terrestrial biodiversity (UNESCO 2018). Of these eight sites, a series of 13 protected area clusters covering an area of more than 1 million ha also conserves the distinctive Fynbos vegetation unique to the Cape Floral Region. In addition, the coastlines of some small towns are

[29] Appendix B is the database of all 113 estates and lists their accurate distances from the nearest protected area.

declared as MPAs and most of the country's MCAs are found in the Western Cape. There are four estates that are within the radius of 11-19 km, and three estates within the radius of more than 20 km from protected areas. It is encouraging to see that all the proposed estates in the Western Cape, except for one to be located within an 8 km radius from a protected area. This confirms that some buffer protected areas, thus maintaining connectivity for flora and fauna.

The estates in the Eastern Cape are buffering nature reserves near the coastal towns. It is the only province where all the estates are the closest to a protected area. Its greatest radius is 10.8 km. Surprisingly, Gauteng which is inland has most of its estates within an 8 km radius from protected areas and only two eco-estates are farthest away at 14.9 km and 14.6 km. Most of the protected areas in Gauteng are classified as local nature reserves managed by the local municipality. In contrast, the Northern Cape and Limpopo provinces host some of the estates that are the farthest away from protected areas – the highest being 94.5 km followed by 34.6 km, 31.7 km, 26.6 km and 20.6 km respectively.

KZN is characterised by provincial nature reserves managed by Ezemvelo KZN Wildlife. Over half of the estates in KZN are located within a 13-29.2 km from protected areas. This may be due most (12) estates being located along the coastline. The Kruger National Park (KNP) in Mpumalanga is one of Africa's largest game reserves. Figure 4.4 shows that there is a range of estates adjacent to the KNP and one proposed eco-friendly estate just outside the park. Its border abuts the KNP as there is no distance between the two. This development is aimed to be more of a holiday resort as it proposes 100 holiday cottages and residences, a lodge as well as a reception, recreation and key staff areas and a nature area.

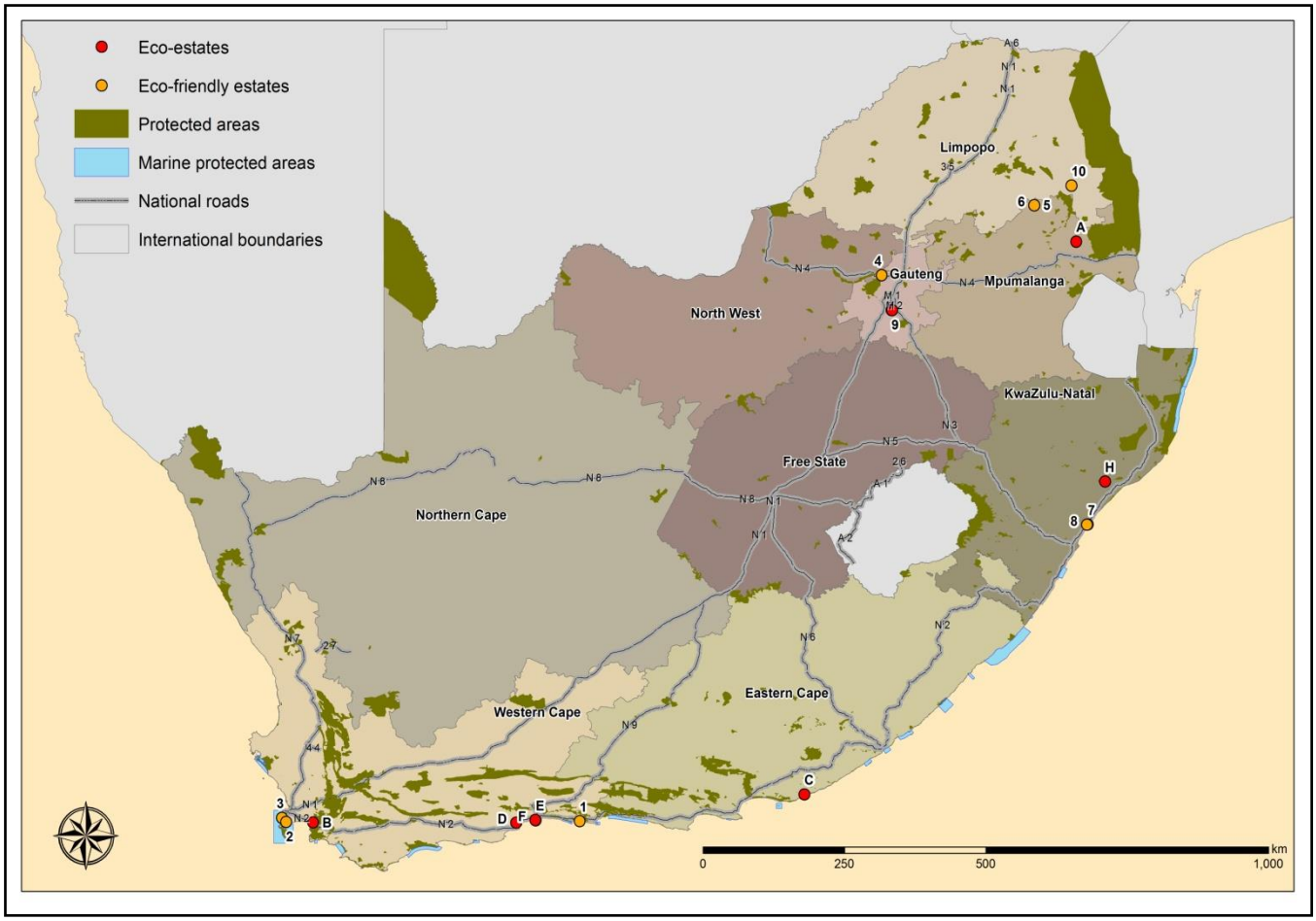
This proposal explains the estate's chosen location, especially since the KNP is very popular among international and local tourists. It also demonstrates that the terms eco-estate or nature estate or any similar terms that refer to a development as an eco-development are used not only for residential estates, but for resorts and hotel-like estates too. Again, the integrity of the term and what it actually denotes are questioned as does Sherriff-Shüping (2015) who insists that an accepted definition of an eco-estate is required and building assessment tools should be used by developers to ensure that environmental sustainability is achieved through these developments.

Under half (47%) of the eco-estates and eco-friendly estates in all the provinces are in proximity of 0-5 km to protected area, with 15% under 1 km in proximity to a protected area. This indicates that some of the estates abut other estates or protected areas so providing a linked network of open space and creating habitat and travel corridors localised and wide-ranging species (Freeman & Bell 2011; Hostetler & Ill 2015). This accords with Mockrin et al. (2017) finding that eco-estates

were neighbouring two or more types of protected areas in Colorado, USA. They concluded that eco-estates do not entirely contribute to the bigger picture of housing and protected lands and found evidence that eco-estates are positioned to promote landscape-level conservation. Mockrin et al. (2017) pointed that it is not informative to only know that a conservation subdivision is positioned next to a protected area. Knowledge is required about how much of its border overlaps with protected areas, as this determines connectivity with protected lands. Therefore, it was important to ask estate managers a range of questions relating to the developments and the adjacent developments or protected areas. The next section deals with these respondents and then their responses.

4.4 INTRODUCTION TO THE SURVEYED ESTATES

Of the 69 questionnaires distributed to managers, 18 (26%) estate managers responded. Ten estate managers responded for eco-friendly estates, while the remaining eight for eco-estates. Figure 4.5 shows the location of the estates for which managers provided information.



Source: Author

Figure 4.5 Location of the estates which participated in the survey

Before further examining the estates, it is necessary to understand the nature of each eco-estate and eco-friendly estate and how they are advertised and promoted as it influences their practices. The next section gives short descriptions of each of the eco-estates and eco-friendly estates for which response were received.

4.4.1 Promotional descriptions of the eco-estates

The short descriptions of eight participating eco-estates are based on information derived from each estate's website which essentially elucidate the way each estate is marketed. The eco-estates are identified with the letters A to H.

Eco-estate A, located in the Mpumalanga, is marketed as both an 'eco' and 'aero' estate. The estate boasts its strategic location as "[j]ust a stone throw [sic] away from the Kruger National Park". Security features are highlighted on eco-estate A's website, along with a range of amenities and services offered within the estate. Eco-estate A makes no reference to sustainability or green building initiatives in the marketing material. The claims is made that the estate will "…offer the ultimate in outdoor living, various activities and a variety of beautiful fauna and flora. Experience natural living at its best, whilst ensuring an exceptional investment opportunity too."

This notion of living in harmony with nature is also promoted by eco-estate B. Located in the Western Cape next to a private nature reserve, the estate is marketed as "[y]our exclusive *nature* [own emphasis] estate." The estate is marketed as a nature and an eco-estate. The estate is said to ensure secure environment, along its location "…minutes away from amenities you may need." The various green initiatives adopted and a commitment to sustainability are spotlighted.

Eco-estate C, located in the Eastern Cape, marketed as a premier eco-development, with world-class design and luxury. The estate offers the opportunity to experience "[n]atural living at its most sophisticated". The exclusivity of the estate is highlighted along with the notions of living in harmony with nature, living in security and experiencing exclusive coastal living.

In comparison to eco-estates A, B and C, the website of eco-estate D in the Western Cape province makes no reference to sustainability or living in harmony with nature. Instead, promotion focuses on its location in terms of it being centrally located and very accessible to highways and airports, and no traffic jams. The estates offering of "…breathtaking views of mountain and sea…in a very rural and peaceful atmosphere" is underlined.

Similarly, the marketing of eco-estate E located in the Western Cape emphasises its location and security. It states that it is a "premium placement" with a combination of cliffside, forest and ocean. Furthermore, it is a mere 10-minute drive from the airport and 20 minutes from schools. Eco-estate

F is adjacent to eco-estate E and they operate as one estate, but each with its own website. Unfortunately eco-estate F's website does gives no useful information about the estate.

Eco-estate G in Johannesburg forms part of a nature reserve and its website refers to living in harmony with nature. This range of information on the website features green initiatives such as energy efficiency, sensitive landscaping and careful design of houses along with an overall commitment to sustainable development. The text does boast the estate being the most upmarket and exclusive private estate.

Eco-estate H is marketed as both as an eco-estate and a golf estate. This estate's website does not provide much information and concentrates on its location in KZN in an important region of the Zululand Birding Route.

It appears that some of the eco-estates represent a combination of two lifestyles. Like eco-estate A which is an eco-estate and an aero-estate. While not all the estates are marketed their green interventions, many do boast their location and exclusivity. It is informative to find out how the eco-friendly estates are marketed and if there are any similarities with the eco-estates in the marketing efforts. This is done next.

4.4.2 Promotional descriptions of the eco-friendly estates

This section considers the eco-friendly estates studied in the online survey. These eco-friendly estates do not contain the term 'eco' in their official names. They are designated here as 1 to 10.

Eco-friendly estate 1 located in the Western Cape which borders on a nature reserve, is marketed as an *eco-estate*, with "[p]anoramic views of the Indian Ocean and magnificent indigenous vegetation." This estate is claimed to be "[t]he most environmentally aware and best luxury development in the world." Because the estate emphasises privacy, it has one of the lowest densities of all estates in South Africa. The promotional text also refers to living in harmony with nature and lists the many recreational opportunities available on the site.

Eco-friendly estate 2, is also located in the Western Cape and the marketing touts the recreational activities it offers and its ethos of "fine living, naturally" and living in harmony with nature. As with other estates, the central location of eco-friendly estate 2 is made very clear: "…close to major highways, top schools, malls and local businesses." Various green building initiatives which have been adopted and commitments to sustainable development are listed.

Eco-friendly estate 3 in the Western Cape is marketed as an *eco-estate* and its centrality to malls, the city centre and schools is promoted. Eco-friendly estate 4 located in the North West is mostly promoted for its location, security and the fact that it has an 'eco-school' on the premises. Eco-friendly estates 5 and 6 are developed by the same developer in Limpopo and so sharing a website.

Both estates are marketed as *eco-estates*. Eco-friendly estate 7 in KZN is a large scale estate which includes a resort, a hotel and a golf course. Although its commitments to sustainable development and environmental sensitivity when building the estate is clear. Eco-friendly estate 8 borders eco-friendly estate 7 in KZN. It is boasted that it is "…conveniently located to malls, business amenities and airport." It is marketed as eco-friendly and as a boutique estate. The promotional material also refers to living in harmony with nature.

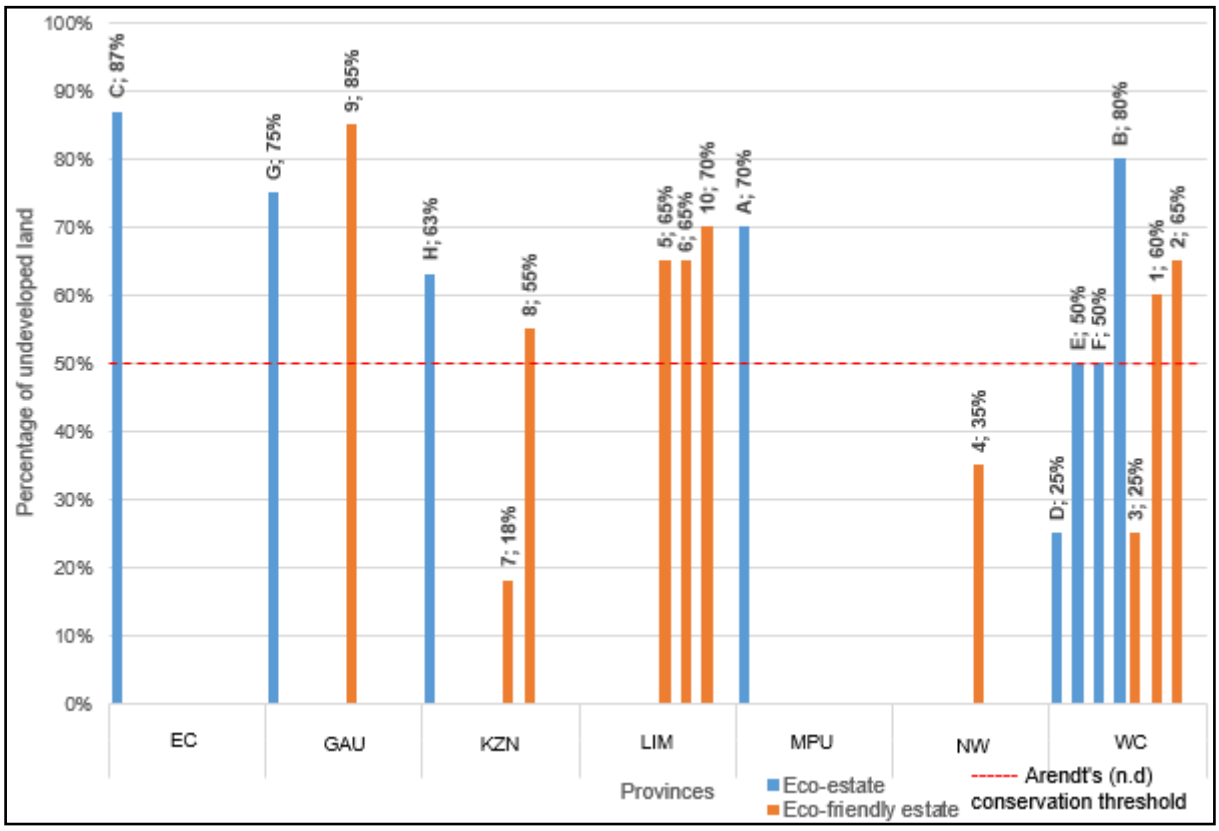
Eco-friendly estate 9 in Gauteng is marketed as an *eco-estate* and a *nature estate* and it borders on eco-estate G. The website refers to the notion of living in harmony with nature and proximity to amenities. Eco-friendly estate 10 situated in Limpopo was originally a cattle farm and it concentrates on the conservation of the wildlife environment. The advertorials contend that "[t]he lifestyle of…residents is preserved and enhanced by eco-friendly rules instilled to encourage pleasant estate living." The estate markets that is built according to specific architectural guidelines aimed at reducing their environmental footprint on the estate and for maintaining natural surroundings.

Similar to the eco-estates, the eco-friendly estates' location and exclusivity is emphasised in their marketing tactics. It is interesting that the eco-friendly estates market themselves as eco-estates despite not having the term 'eco' in their official names. Most of the estates do make reference to 'living in harmony with nature'. The discussion now turns to the survey respondents' responses about the location, site characteristics and practices of the estates they manage.

4.5 ESTATE MANAGERS PERSPECTIVES ON THE 'ECO-NESS' OF THEIR ECO-ESTATES

The 18 respondents all indicated that a proportion of the estate remains undeveloped. According to (Arendt n.d.) eco-estates should conserve at least 50% of the buildable land. Figure 4.6 shows the percentage of undeveloped land in the eco-estate and the eco-friendly estates. Given that nearly 80% (four out of five) of these developments have conserved 50% or more of their open space, indicates that the first and foremost goal of conservation has been accomplished. Of course, some more than others, but this conservation of ecologically significant land sets these developments apart from conventional developments (Carter 2009). The undeveloped land in eco-estates range from 25% to 87% and the undeveloped land in eco-friendly estates range from 18% to 85%. The estate manager of eco-estate B argues in the estate's EIA that a scenario of 20% of the site developed and 80% conserved and managed properly is more desirable than a situation where the site is left undeveloped and covered by alien vegetation or used for agriculture (Planning Partnership 1998).

As illustrated in Figure 4.6 there are some significant differences between the undeveloped land in eco-estates and eco-friendly estates and also between the same type of estates. The differences range between 7% and 69%. Eco-friendly estate 7 has the least (18%) undeveloped land and eco-estate C has the most (87%) undeveloped land. This is a major difference of 69%. Other significant differences include the 55% between eco-estate B and eco-estate D in the Western Cape and between eco-friendly estates 7 and 8 in Limpopo where there is a difference of 37%.



Source: Survey of estate managers

Figure 4.6 Percentage of undeveloped land in the participating eco-estates and eco-friendly estates

On average the eco-estates have 63% of land undeveloped, while eco-friendly estates have 54% undeveloped land. Milder (2007) and Carter (2009) contend that the uses to which of the open space is part are crucially important. If used more for recreation and aesthetics than for conservation, the space may not transcend ecological functions locally and regionally.

The majority (94%) of the estate managers indicated that the undeveloped land in their estates is used for recreational activities. Sixteen (88%) of the respondents stated that the undeveloped land has walking, hiking and biking trails in combination with other recreational activities. Eleven (69%) of these sixteen responses stated that walking, hiking and biking trails were the only activities taking place on the undeveloped land. The other five respondents listed the following in

combination with walking, hiking and biking trails: picnic areas, play areas for children, tennis, cricket, golf, horse riding, nursery for plants and communal gardens.

Trails or pathways are vitally important sustainable design features in development sites. Not only do they contribute towards green infrastructure in the form of greenways, they offer opportunities for the protection of habitats and indigenous vegetation, and appreciation of nature (Porter 2012). Trails and pathways also encourage transportation by cycling or walking and thus contributes as a site for physical activity, thus improving well-being (WHO 2018). All the estate managers indicated that residents enjoy using the walking, biking and hiking trails or paths and they often receive positive feedback about the trails.

The manager of eco-estate A reported that the trails and paths are regularly maintained by the HOA. In addition, Developer A mentioned that hiking trails, mountain biking trails and paths are all very appealing, especially to the younger generation in light of the shift in thinking to healthier lifestyles. Developer A asserted that this is supported by health insurance companies like Discovery Health which reward their clients for being more active. Many residents would prefer to be more active in a secure environment which is what a gated community sets out to provide.

The estate manager for eco-estate A only reported the availability of a tennis court and a squash court on the development site. Eco-estate C's land is not used for any recreational activities and is left undeveloped solely for nature conservation. It is evident that the estates make provision for a range of recreational activities all of which are a low-impact in nature other than the golfing activities. The use of the undeveloped land in the studied estates is commendable. It indicates that the estates are conserving the land in the state it was found thereby enabling ecological functions to occur, and flora and fauna to thrive.

Eighty-eight per cent of the managers responded that there is some kind of ecologically significant feature within the development. Under half (44%) of the respondents reported the presence of a wetland in the estate. According to Arendt's (1996) classification of PCAs and SCAs wetlands are PCAs and they are considered unsuitable for development. Fortunately the wetlands are being protected in these estates. South Africa has various legislation in place protecting wetlands, such as NEMA, which requires environmental authorisation before development in wetlands can takes place. NEMA requires that the land is surveyed for the presence of any ecologically significant features before any development occurs and the knowledge is used to conserve the portions of the site which have high resource value, such as a wetland. The surveying of the land before any development takes place is a crucial and the first step according to Arendt's (1996) steps in creating a conservation development.

All of the estates, except eco-estates A and H and eco-friendly estates 2 and 8, have permanent environmental consultants or nature specialists for the estate. Their duties were listed by the estate managers as implementing and managing the environmental management plan (EMP) and the EIA. These are all requirements of NEMA. Furthermore, their duties involve enforcing the estate's constitution, adherence to architectural design guidelines, providing ongoing audits and giving advice on ecologically significant matters. Pejchar et al. (2007) maintains that this continuous stewardship not only of the undeveloped land, but the entire estate is what sets an eco-estate apart from other gated communities. Furthermore, regulations such as an EIA are central to ecological modernisation. They prevent environmental costs and ensure continuous competition because businesses are able to profit from protecting the environment.

In the case of eco-estate C, the environmental consultant/nature specialist is also responsible for ensuring that there are no domestic pets on the estate. Milder (2007) reported that only a handful of eco-estates restrict disturbances by domestic pets. The present study found that 78% of the estates allow domestic pets. The presence of domestic pets on these estates has is a potential disturbance not only for the wild animals on the estates, but also for other residents (Milder 2007). According to Abrahams (2017), the no-pet policy in some estates has created controversy among potential residents because potential residents who would like to move to estates for security and safety reasons are discouraged due to the no pet policies.

Other ecologically significant features mentioned by the managers are steep slopes, dams, various forest types, historical cultural and archaeological sites, natural ravines and Red Data species. Fourteen (87%) of the respondents stated that these ecological features, including trails and paths, are connected to adjacent developments and protected areas.

Eco-developer A and B and developer A reported that the eco-estate and eco-friendly estate borders usually overlap with a protected area or another eco-estate. Although the reported percentages do vary, they are usually between 10 and 25%. Therefore, connectivity with protected lands or other estates does exist. According to three developers surveyed in this study, the reasons for establishing contiguous protected areas are to promote the movement of indigenous flora and fauna between the areas; protect wetlands; increase biodiversity and the size of the conservation area while still retaining the security requirements of a gated estate. This highlights security as a priority.

The estates in this study have adopted a range of processes to maintain these links namely bush clearing, alien plant eradication, planting of indigenous vegetation and the adoption of environmental management plans for the estate and surrounding estates and farms. The eradication of alien vegetation and the rehabilitation of existing natural areas are of primary importance for

ensuring long-term conservation, albeit, at considerable expense. According to various EIA documents it is usually the estate's residents who pays for processes like alien clearing (Planning Partnership 1998; Common Ground Environmental Consultants 2008). Therefore, a managing authority like SANParks will support a development's establishment, even more when the conserved land in the development is, for example, ceded to the authority. In a context of limited public funds for nature conservation and urban sprawl it is understandable why higher authorities prefer these private estates to pay for actions such as alien clearing and they therefore approve these developments, even if they are not sustainable. Consequently, Ballard & Jones (2011) have argued that buying into these estates is a form of ethical consumption. Potential buyers are informed that they will be supporting in good causes like the rehabilitation and preservation of nature when purchasing land or a home in such estates.

With processes in place to maintain the links between neighbouring sites, one would assume that flora and fauna are able to migrate efficiently, especially since this is an aim of the developers of these estates. Sadly, the opposite is occurring. Seventeen (94%) of the estate managers answered that there is wildlife present within their estate boundaries. However, only nine (53%) of the 17 estate manager's stated that there is some sort of movement corridors for the animals. These managers indicated that not all the boundaries have fences and therefore animals are able to move in and out of the estate. In eco-friendly estate 1 this has been enabled by building an animal culvert under a public road, while in eco-friendly estate 3 has built small tunnels for smaller animals, have been provided.

The eight (44%) estate managers who indicated that there are no movement corridors gave the security concerns of the estate as the reason. For example, the manager of eco-estate G stated that "[n]o, it is a closed system as this is also a security controlled environment." Similarly, only 10 (56%) managers reported that there are biodiversity corridors for plants which link it to areas outside of the estate. The manager of eco-friendly estate 9 elaborated stating that "[p]roperties bordering on the nature areas are not allowed to have walling, palisade fencing is mandatory to allow corridors and linking with nature." Clearly security remains a priority, even ranking higher than the conservation of nature. The respondent for eco-friendly estate 8 stated "[y]es, however due to security reasons, we have had to keep certain corridors clear on fence-line borders." This, of course, defeats the purpose of eco-estate aims to creating contiguous protected areas. It also points to the commodification of nature, literally by making nature exclusive, bounded so and bordered that there is no way for it spill over into neighbouring sites.

4.6 CONCLUSION

The analysis of the national picture of eco-estates and eco-friendly estates in South Africa attests to the key role of location in terms of the success of these developments. Eco-estates require large open spaces preferably where flora and fauna is abundant, a location on the urban periphery and the added amenities of being located in tourist towns or along the coast. It is understandable why the country's major metropolitan areas were found to have the most estates. These metropolitan areas are the most economically advanced provinces, which offer more opportunities and thus there is a demand for secure housing.

The analysis revealed that eco-estates and eco-friendly estates are often located adjacent to some type of protected area or another eco-development. It was also established that the aim of creating contiguous protected areas is not always met owing to security considerations which are given priority. Walls, boundaries and fences sometimes tend to the restrict movement of flora and fauna, thus disrupting the natural ecology.

The majority of the estates have some proportion of open space which is left to be conserved as best in its natural state. Most of the estates allow recreational activities in this space and most of the recorded activities are characteristically of a low-impact. Trails and paths were the most common type of facility and contribute towards green infrastructure – ecology's lifeline. The conservation of land in these estates can be easily enhanced by green interventions through the practice of green building. The next chapter turns to an examination of whether or not eco-estates and eco-friendly estates in South Africa have adopted green building practices.

CHAPTER 5 AN ANALYSIS OF ECO-ESTATE PRACTICES IN SOUTH AFRICA

5.1 INTRODUCTION

This chapter builds on a topic introduced in the previous chapter by elaborating on practices of the estates relating to energy, water and waste. It addresses objective four of the study by assessing the level to which eco-estates and eco-friendly estates contribute to greening interventions. There is an emphasis on the environmental element of sustainability in this analysis as claims made by eco-estate developers and managers centre on the environment. The practices the estates have adopted of preserving natural conditions and using their open space for conservation purposes and low-impact recreational activities enhances the coexistence of the environment, buildings and their occupants (Sev 2008). Given the environmental impacts of the built environment, it would be a fundamental flaw to view the human component and the natural environment as mutually exclusive (Sev 2008). It is thus essential that eco-developments are established in a way in which makes living in harmony with nature possible.

Sustainable construction through the use of green building allows for this as it aims to restore and maintain harmony between the natural and built environments (Du Plessis 2005). Green buildings have become a necessity today for achieving the goal of sustainability within the built environment, for enhancing the health of ecosystems and protecting natural resources (Chatterjee 2009; African Green Elements 2016). The green building trend has grown steadily in South Africa owing to rising energy and water costs and the global awareness of climate change (Gunnell 2009; King 2016; World Green Building Trends 2016). However, this growth has mostly been embedded in the commercial sector leaving a gap eco-estates and eco-friendly estates have risen to fill in the residential sector. Since these estates are marketed as eco-developments, it has become vitally important to investigate whether they are developed for altruistic reasons or are simply greenwashed. This can be achieved by considering the practices adopted by the two types of estates (Objective 4) and this will also bring out the potential differences between the two types of estates – the ultimate aim of this study. The chapter also deals with the underlying question of what an eco-estate is and addresses Objective 5, to create a categorisation of eco-estates and eco-friendly estates. The chapter concludes with a look at the way forward for eco-estates in South Africa.

5.2 GREEN BUILDING IN ECO-ESTATES AND ECO-FRIENDLY ESTATES

The sustainability of any development is highly dependent on the choices and practices adopted by property developers regarding buildings and developments because they influence all aspects of sustainability, environmental, social and economic (Beuschel & Rudel 2010; Sherriff-Shüping

2016). Buildings in particular have far reaching-consequences because the materials and components used in their construction influence land and energy and in turn impact on global issues such as climate change (Beuschel & Rudel 2010). Therefore, it is vital to examine the practices adopted within estates that claim to be or are marketed as an eco-development.

Information about the practices discussed in this chapter was elicited from 18 estate managers who responded to the online questionnaire. However, before turning to the specific practices, it is essential to understand the motivations and reasons behind developing these types of estates because they inform the various practices carried out in the estates, including the type of lifestyle the estate has to offer. This understanding is key as these developments are purpose-built to be sustainable (Hello House 2016). The chapter also consider the various green building practices the estates have adopted regarding energy, water and waste. The discussion is limited to practices relating to these three elements of green building and it does pay any attention to Wachsmuth & Angelo's (2018) green walls, gardens and eco-roofs which are not central to the ecological impacts of these developments. Clarity on the term eco-estate is also sought.

5.2.1 Reasons for the move toward green building

The developers consulted in this study gave different reasons for their involvement in developing an eco-estate or eco-friendly estate. For Developer A it is the "…obligation to ensure that a balance between economic development and sustainable eco systems is achieved." This agrees with the finding in the World Green Building Trends (2016) report that 40% of the respondents indicated green building was the right thing to do. Whereas it is significant to achieve a balance between economic and environmental components, Developer A's reasoning omits the equally important component of social development. Eco-developer A stated: "[i]t is essential for new developments to be more eco-friendly." This is a general statement in that all developments need to be eco-friendly in today's context. Eco-developer B stated that their motive was "[t]o extend and protect the protected area adjacent to the estate." Eco-developer B builds eco-developments with the aim of eco-estates to buffer protected areas while still accommodating residential housing. If done correctly this would be a model eco-estate. Similarly, Milder & Clark (2011) found that buffering a protected area was an objective of conservation development in the USA.

Regarding the general goals to be achieved through this type of development, eco-developer A supported the use of "[i]ndigenous plants, grey water usage and solar energy." Eco-developer B's more general overview was "[t]odevelop a unique eco-friendly environment within which residents are able to enjoy nature and wide-open spaces, within in a secure estate." Eco-developer B also mentioned that an eco-estate's main conservation goal is:

> To develop the property in a sustainable way by encouraging appropriate architecture and green technologies i.e. solar, rain-water harvesting etc. Remove and eradicate all alien vegetation and establish a viable & sustainable fauna and flora population with special emphasis on having a small but sustainable Oribi population.

The eco-developers listed a range of green interventions, as represented above, that they believe should be the goals of such developments. In contrast, Developer A stated that their main conservation goal was "[t]o ensure that original eco-systems remain in place." Essentially this implies that some land should be left undeveloped and should be conserved. Two developers agreed that these goals are usually achieved, while one indicated that they are 'sometimes' achieved. It is evident that conservation, the well-being of nature and sustainability are priorities for the developers of the eco-estates and eco-friendly estates. Furthermore, since two of the developers stated green interventions as goals, it confirms that developers are aware of the benefits of green building. However, it has been argued that the understanding of the concept of an eco-estate is not adequately transferred from developers to HOAs and to residents (Austin 2004). Moreover, management goals have been found to be different from the initial goals set by developers (Austin & Kaplan 2003). Therefore, it was important in this study to concentrate on the specific practices carried out in the estates, especially since the undeveloped (conserved) land in these estates is the responsibility of HOAs which employ an estate manager for the task.

All three developers responded that a HOA manages the undeveloped land. Two developers stated that the government does not have the capacity to manage the conserved land nor is there government support to implement projects to their greenest potential. As a result, these developments cannot develop to their full green capacity or function according to their desired aim or goal of being eco-friendly. This situation is confirmed by Ballard & Jones (2011) who found that the local government is not always willing or able to provide required infrastructure for these estates. This constrains the growth of green building in South Africa as contended by the World Green Building Trends (2016) report.

This may change in the near future as the spotlight moves to the residential sector regarding green building (King 2016; Mahlaka 2016; World Green Building Trends 2016). The World Green Building Trends (2016) has reported that lack of political support and incentives are among the top barriers to growth of green buildings around the world. Samari et al.'s (2013) investigation of the barriers to progress in green building in Malaysia found that government has a key role to play in the promotion of green buildings, by implementing structural incentives, subsidy and rebate programmes, tax incentive schemes, low interest mortgage loans, voluntary rating system, and market and technology assistance. These are important ways of eliminating the barriers to the institution of green building. The South African government has also adopted regulations to

promote the development of green buildings. Regulations such as SANS 10400-XA (2011) and SANS 1544: energy performance certificates for building and the carbon tax policy (Department of Public Works n.d.). Since South Africa has been struggling with rising energy costs, energy and water efficiency (EDGE 2018) have been placed at the forefront of the country's green building interventions.

5.2.2 Energy efficiency practices

Since the South African national building regulations have provided guidelines and general requirements for energy efficiency since 2009 and that compliance has recently made mandatory for all new buildings and refurbishments (SANS 10400-XA 2011), it is expected that most of the eco-estates and eco-friendly estates will have energy-efficient practices in place. This study only investigated established estates, some estates could have been well developed prior to the release of regulations. However, as LeGates & Stout (2015) point out, it is possible for buildings to be retrofitted with green interventions. Theunissen's (2016) study on green building strategies and investment in the South African real estate industry revealed that the retrofitting of buildings is much more expensive than building green from the beginning. In this context Reuters (2018) argues that although families in South Africa are retrofitting their homes with energy-saving devices like LED lights, low-flow showerheads and solar panels, the retrofitting of homes to be green can probably only be afforded by a certain class.

More than three quarters (77%) of the estates participating in the online questionnaire have lighting fixtures and appliances classed as highly energy efficient. According to CoCT (2012) the use of energy-efficient electrical installations, such as light bulbs, is probably one of the easiest and most cost-effective means to save energy. Therefore, it is understandable why the majority of the estates have adopted this practice. Respondents for eco-friendly estates 5, 6, 7 and 8 reported that no lighting fixtures or appliances are energy efficient in their estates.

Only seven estates (three eco-estates and four eco-friendly estates) have highly efficient lighting and appliances which are installed in communal areas *and* estate homes. Of these seven, only eco-friendly estates 1 and 2 have lighting mentioned in their architectural guidelines regarding the types of bulbs to be used by homeowners. The others make *no* mention of lighting fixtures or appliances. Similarly, the rest (11) of the estates also make *no* reference to lighting fixtures or appliances in their architectural guidelines.[30] In these 11 estates that only the communal are fitted with energy-efficient lighting and appliances, although homeowners are *encouraged* to use energy

[30] Some of the estates' architectural guidelines were not available or accessible and thus they were grouped into a 'no mention or no reference to lighting and appliances' category.

efficient appliances and lighting. It appears that the use of highly efficient lighting and appliances is *not mandatory* in eco-estates or eco-friendly estates, despite it being a national regulation.

Moreover, the use of alternative energy sources is also *not mandatory* in some of these estates. In 72% of the estates some of the energy requirements are met from renewable sources. In five (28%) estates no energy is sourced from renewable energy. Four of these cases are eco-friendly estates and one is an eco-estate. Just under half (46%)[31] of the estate managers stated that the houses in their estates make use of solar photovoltaic (PV) panels. Another 46% use a combination of a solar PV panel and a solar hot-water system. It is significant that only one eco-estate reported this, the rest (four) eco-friendly estates. A developer stated that *eco-estates* have *more* green building features than *nature estates* (which falls under the category of eco-friendly estates in this study as they do not contain the prefix 'eco' in their official name). Only one (8%) eco-estate reported the use of solar hot-water systems only.

Only three (17%) estates make use of alternative energy sources which is mandatory. Eco-friendly estate 1 is such a case. The estate's states that "[a] minimum of 2% of the cost of the building *must* [own emphasis] be allocated for active energy saving techniques and systems." A similar guideline for eco-friendly estate 7 states that "…PV panels and solar panels are to be designed as an integral part of the roof." However, the respective estate manager reported that no energy requirements are met with renewable sources. Thus, indicating conflicting information – the practices stated in the architectural guidelines do not match with the findings in the online survey. The guidelines of eco-estate A makes it very clear that: "[s]olar heating panels are *compulsory* [own emphasis]." An article in *Finweek* (2012), notes that eco-estates have no requirements to ensure that owners use renewable energy.

Despite solar PV panels not being mandatory in most of these estates, their prevalence may be owed to the fact that since 2009 national legislation requires that all new hot-water systems to be supported by solar energy (*Finweek* 2012). This is enforced by regulation SANS 10400-XA and the country's carbon tax policy. Furthermore, it could be attributed to a sense of conspicuous conservation[32] as Sexton & Sexton (2011) have argued. The fact that PV panels are visible from the street, homeowners invest more money in solar PV panels, while underinvesting in other green

[31] N=13

[32] Conspicuous conservation is the behaviour by consumers in expensive actions to show that they are environmentally friendly or green (Sexton & Sexton 2011).

interventions. The visibility of solar the PV panels, signals that homeowners are environmentally friendly or green people.

In addition to active design strategies, eco-friendly estates 1 and 2 and eco-estate A have also made the use of passive design energy principles *mandatory*. Passive design enables a system to not use extra energy for heat in winter and cooling down in summer (CoCT 2012; *Finweek* 2012). In total 11 (61%) estates have incorporated passive design features. Six (33%) estates have incorporated passive solar design or passive strategies such as orientation, shading, ventilation and glass selection. There are more eco-friendly estates (4) in this category than eco-estates (2). Three eco-estates have placed importance on glass selection. Specifically, they have used double-glazed windows. Only one eco-friendly estate indicated the use of green walls[33] and roofs[34] along with orientation and shading. Finally, one eco-estate has only made use of shading through incorporating a large veranda in each houses' design. Similarly, Sherriff-Shüping (2015) found that eco-estates in Johannesburg use less energy through passive design.

Since the aim of green building is to be sustainable by aiming for low carbon emissions and by being energy efficient (Gunnell 2009), it is heartening that eco-estates and eco-friendly estates have adopted if not all, at least some energy-efficient practices. However, since these estates are marketed as being sustainable, green and ecologically inclined, it is important they have stringent rules to support this notion. Energy efficiency should not be voluntary or simply encouraged, especially in South Africa's current energy context. It is important that sustainable energy through the use of alternative energy, and design features like passive design be adopted, as this will minimise the ecological impact of buildings and increase self-sustainability.

5.2.3 Water-efficient practices

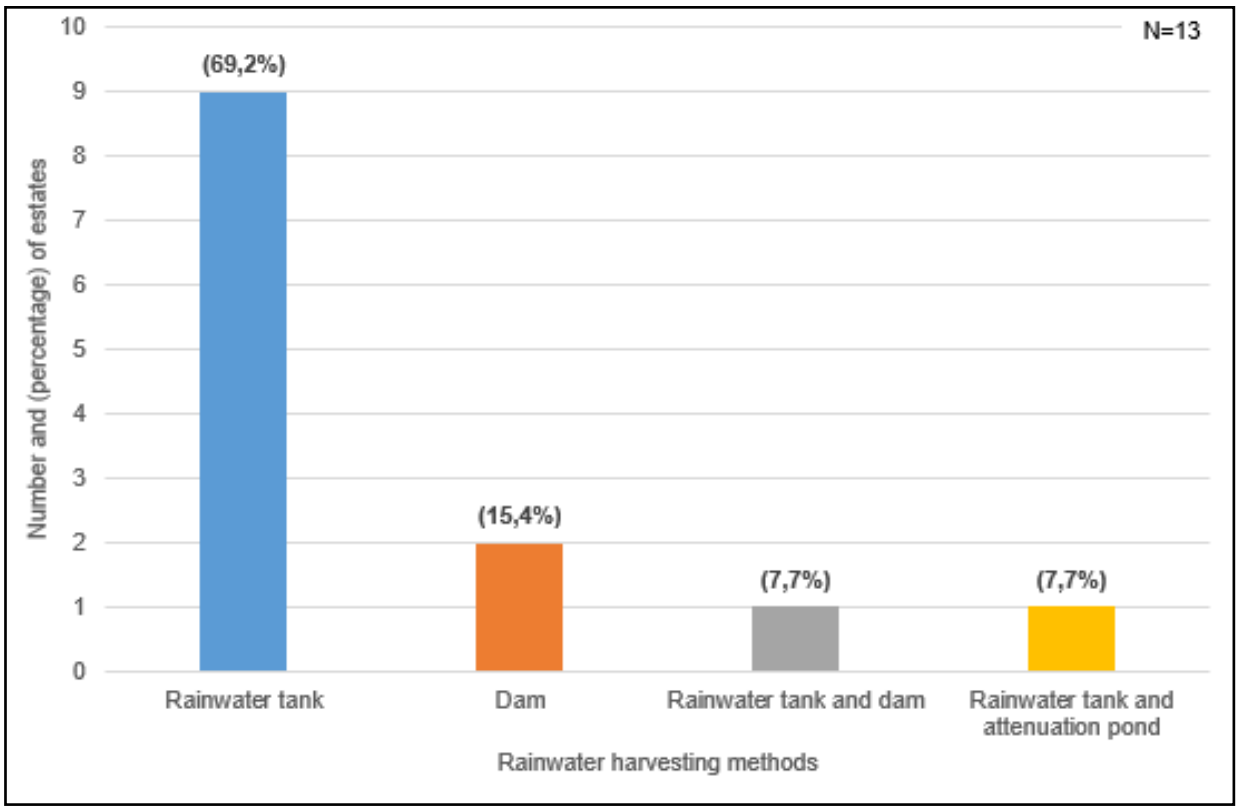
South Africa's recent drought has spurred on new and old interventions to increase self-sustainability in a water-stressed country (Otieno & Ochieng 2004). It is understandable why 72%[35] of the estates harvest rainwater on-site. The use of an alternative water source has the potential to reduce the demand for already limited, potable water (CoCT 2012). The estates that indicated otherwise (5) are all eco-friendly estates. Of these five, eco-friendly estates 5 and 6 harvest no rainwater at all. However, in eco-friendly estate 4, 9 and 10 the harvesting of is a fairly

[33] A green wall is defined as "…vegetated walls that may be implemented as elements of a building or as freestanding partitions" (Armitage et al. 2013: 21).

[34] "A green roof is a roof on which plants and vegetation can grow. The vegetated surface provides a degree of retention, attenuation, temperature insulation and treatment of rainwater" (Armitage et al. 2013: XVII).

[35] Eco-estates accounted for 44% and eco-friendly estates 28%.

new practice and is now being implemented and incorporated in the estate guidelines. Figure 5.1 shows the various rainwater harvesting methods adopted by the estates.

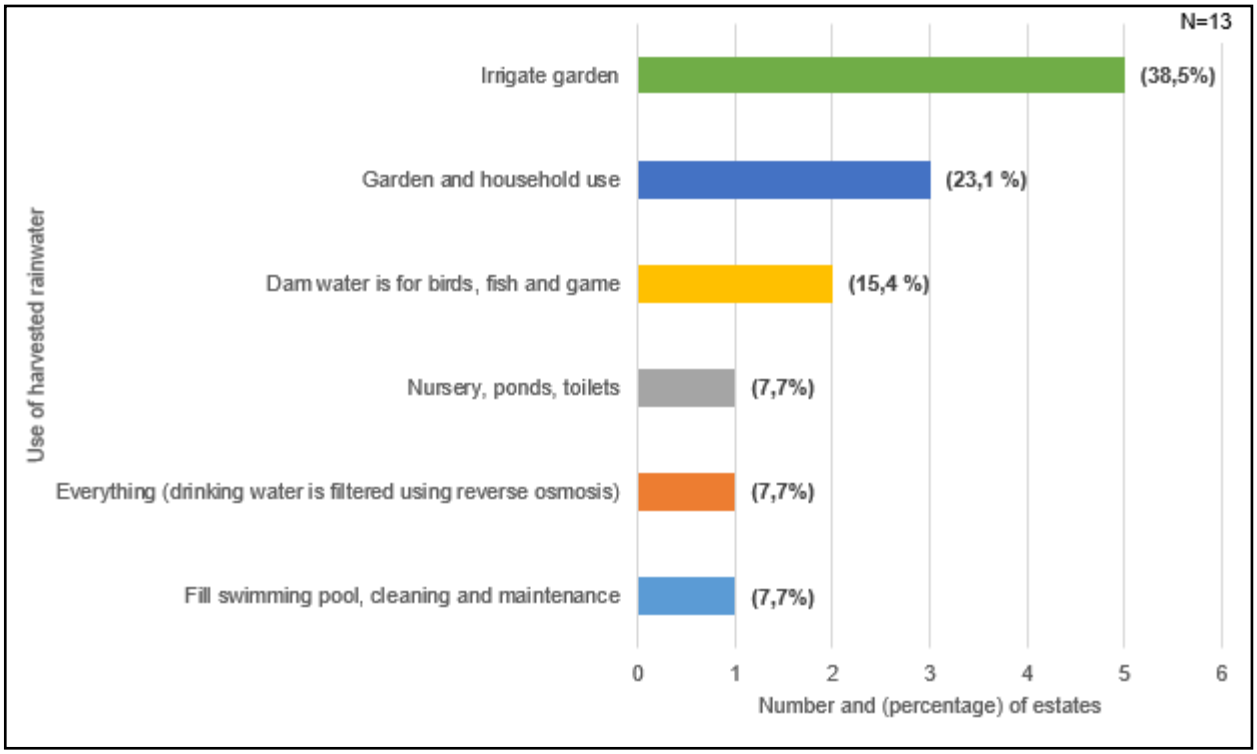


Source: Survey of estate managers

The majority (69%) use rainwater tanks to store rainwater collected rainwater from roofs. Only in six estates (eco-friendly estates 1 and 2 and eco-estates A, C, E and F) is this practice mandatory. For example, the following appears in eco-estate C's guidelines: "[r]ainwater runoff is to be controlled so as to feed into a *mandatory* [own emphasis] water reservoir, minimum capacity 50 000 litres." The remaining estates stated that they use combinations of rainwater tanks and dams or attenuation ponds[36] or simply make use of on-site dams as their only method of capturing

[36] An attenuation pond "…is a facility which temporarily stores excess stormwater runoff with the intention of reducing the flood peak" (Armitage et al. 2013: XIX).

rainwater. A truly green eco-estate is expected to reuse water that is harvested (*Finweek* 2012). All the estates where rainwater is harvested also reuse the water in various ways (Figure 5.2). The most popular (38%) use for rainwater is to irrigate gardens. According to Sev (2009) rainwater collected for irrigating the garden considerably reduces the use of potable water.



Source: Survey of estate managers

Figure 5.3 The various uses of rainwater harvested in eco-estates and eco-friendly estates

The second most popular use of the rainwater combines irrigation and household use. The estates rainwater is harvested through dams do not actually make use of the water. Instead, it is left for nature, as intended, for birds, fish and game on the estates. Only on eco-estate C is the rainwater used for 'everything', including the preparation of drinking water through reverse osmosis[37], every home in their estate is self-sufficient regarding water supply, independent of municipal water. All the eco-estates and eco-friendly estates should be striving for self-sufficiency in certain aspects, especially since they are purpose-built to be sustainable (Hello House 2016). But this does not seem to be the case. The estates (15%) used the rainwater for general maintenance, to water their nurseries, to flush toilets and to fill swimming pools in their clubhouses.

[37] Reverse osmosis is referred to as "[a]process in which liquid flows through a semi-permeable membrane used to separate two solutions. The most concentrated solution is a pressure above that of the osmotic pressure. This causes the liquid to flow from the more concentrated solution to the less concentrated solution" (Schaschke 2014: 327).

The estate managers were asked how communal gardens or green areas are watered and what the source of this water is. In most (39%) of the 18 estates indicated communal gardens are not watered as the gardens comprise of indigenous plants and therefore, watering is dependent upon rain. Only one eco-friendly estate does not have large communal gardens and land cover is mostly in natural veld. All the estates, except eco-friendly estate 8, have adopted indigenous landscaping or also known as xeriscaping. Furthermore, 94% of the estates have lists of specified plants the homeowners and estate must adhere to. The use of indigenous plants is important as they are more water efficient and appropriate for the climate of South Africa (CoCT 2012). However, this does question one of the developer's notion that a *nature estate* in comparison to an *eco-estate* is mostly covered in 'pure nature', with no manicured lawns or tended gardens. Perhaps this is the situation where a developer's original ideas or goals of a development are not transferred adequately to estate managers or HOAs. Ballard & Jones (2011) contend that the word 'indigenous' has become a marketing tool. Planting indigenous vegetation becomes important not only for environmental protection, but for economic reasons too. Landscape architects choose to landscape with indigenous plants, despite the cost, in order to meet market demand (Ballard & Jones 2011). The purchasing of property in an indigenously landscaped estate then becomes a form of ethical consumption which is in many ways a form of competitive altruism (Ballard & Jones 2011).

Eco-friendly estates 3, 4 and eco-estate G use groundwater or borehole water to irrigate communal areas on their estates. Groundwater was the second most popular source of water for the communal areas. In eco-estate G groundwater is used to water golf greens and tee boxes. Golf estates have been criticised for consuming vast amounts of water and other environmental inputs (Western Cape Provincial Government 2005; Cock 2008). Van Zyl's (2006) study of the golf-scape in the Western Cape's Garden route involved a strengths, weaknesses, opportunities and threats (SWOT) analysis of golf estates and found that the threats golf estates pose to sustainable development include urban sprawl, high water consumption and the use of pesticides and fertilisers. It is heartening that eco-estate G uses borehole water instead of municipal water to water golf greens. Groundwater is an important alternative source of water that should not be over-exploited considering the current drought situation in South Africa (Mistry & Spocter 2018). The drought (2016-2018) in South Africa is caused lower than normal rainfall in the Western Cape, Northern Cape and Eastern Cape (South African Weather Service 2016). Golf courses are an artificial concept that should not be associated with eco-estates as they disrupt the ecological functioning of open space within such estates (Koblitz 2006; Carter 2009). Thus, questioning the eco-ness of eco-estate H. De Beer (2014) found that it is becoming problematic for developers to acquire environmental authorisation for golf estate developments owing to the negative impacts on

environmental sustainability associated with these types of development. Therefore, it could be proposed that eco-estate G, uses the marketing of nature as a strength and thus the motivation to conserve becomes a reality within eco-golf developments (Van Zyl 2006).

It is noteworthy that eco-friendly estates 5 and 6 and eco-estate G all use municipal water for watering their communal areas. Eco-friendly estates 5 and 6 have not reported any green interventions – no energy-efficiency or water-efficiency practices thus far. They do make use of indigenous plants, so that it is assumed that their communal areas do not require vast quantities of water. Three estates reported use of combinations of water sources for communal areas: dam and rainwater, rainwater and groundwater, municipal water and a rainwater tank. Only one estate indicated that they use water from a rainwater tank.

Regarding the equipment used to water communal gardens or green areas, only five estates responded. Three estates use irrigation system and one estate uses underground drip-feed irrigation. The Installation of water-wise irrigation systems allows for water efficiency. Water-efficient appliances like low-flow devices can save up to 50% of water (Sev 2009; CoCT 2012). Twelve estates reported that the taps and other water uses within the estate are water efficient. Half of these estates cited that they make use of reduced-flow mechanisms. Although the estate managers were not specific, some mentioned tap aerators and others listed dual-flush systems. Two estates have no specific water-efficient appliances installed, but they conduct daily and monthly checks for leaks or spillages. The managers of the remaining four estates may have misunderstood the question and responded with the following answers: “[a]ll swimming pools are covered” (2); “[w]e do not use municipal water, we have our own boreholes and are water conscious” (1); and “[w]e have two boreholes and Randwater” (1).

Eight estate managers indicated that grey water is collected, recycled and reused in the estate. Four of these managers stated that the collection and reuse is dependent upon residents as it is not prescribed in their guidelines. Eco-estate A’s manager stated that all the homes on the estate must install a greywater system for use in gardens. This corresponds with their architectural guidelines: “[g]rey water recycling is obligatory whereby shower, bath, basin and washing machine water is re-used. Careful planning and use of proprietary systems are to be done.” Eco-estate C and eco-friendly estates 7 and 10 all have their own sewerage treatment plants and the water is reused in the gardens within the estates. Figure 5.3 the sewerage treatment plants of eco-estate C and eco-friendly estate 1. Figure 5.3 clearly shows that the plants use different technologies with eco-estate C’s on a bigger scale. However, both disinfect or sterilise the effluent to ensure that no harmful bacteria enter the environment. Eco-friendly estate 7 does not have a sewerage treatment plant in

the estate but recycled water from the municipal sewerage works is pumped onto the estate and used for irrigation.

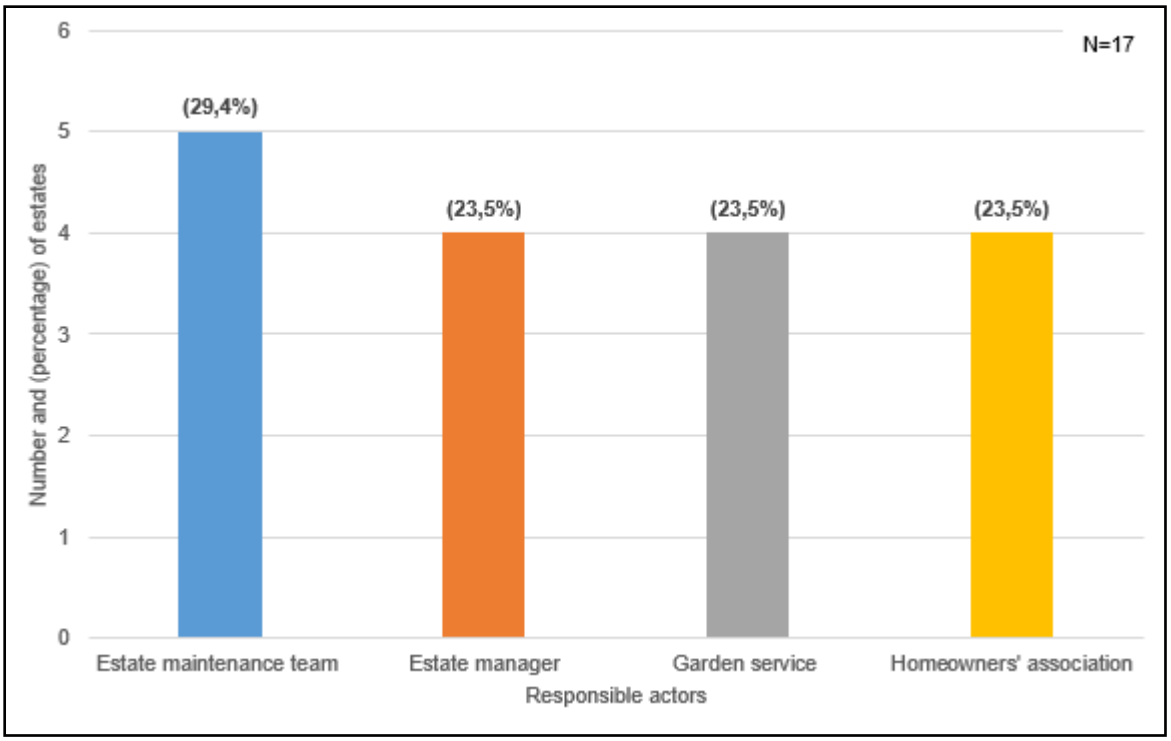
Source: Managers of eco-estate C and eco-friendly estate 1

Figure 5.4 Sewerage treatment plants of eco-estate C and eco-friendly estate 1

The evidence presented in the above discussion that eco-estates and eco-friendly estates mostly use alternative sources of water for garden irrigation purposes. The gardens are mostly plant and/or lawn types as none of the estates in this study have any form of agricultural activity. There are no communal food gardens or vineyards or orchards. The absence of agricultural activity in these estates increases their eco-ness because true eco-estates prohibit agricultural activity (Koblitz 2006; Elaleni Coastal Estate 2016). As discussed in Chapter 4, the absence of this practice alludes to a very 'selective sustainability' produced by these estates.

The communal garden areas are in most cases (29%) maintained by the estate's own maintenance teams (Figure 5.4). The reason for this is quite likely related to security concerns. Three out of four (76.4%) of the estates did not use outside help for garden maintenance and instead the estate managers and HOA's take on the responsibility. Security in these estates is of utmost importance and the estate websites prioritise it above their ecological and sustainability promises. Since the most prominent motivation for establishing gated communities in South Africa is security (Landman 2004; Spocter 2016), it is understandable why eco-estates also may prioritise security in their marketing efforts. However, Spocter's (2016) study of non-metropolitan gated retirement communities in the Western Cape found that security was not the foremost reason for retirees

choosing to reside in gated communities as some residents were simply attracted by the lifestyles offered by the various gated communities.



Source: Survey of estate managers

Figure 5.5 Actors responsible for maintenance of communal gardens and green space in eco-estates and eco-friendly estates

This finding agrees with that of Sherriff-Shüping (2015) that estate documents fix on aesthetic appeal, security and exclusivity instead of on what makes them green or eco-interventions that lead to sustainability. This is significant in light of all three developers mentioning that the target market for this type of development are environmentally-minded populations – those who have a keen interest in preserving the environment and who share goals of ensuring a suitable balance between economic development and the preservation of the environment. Therefore, it is expected that these estates would showcase their environmentally-inclined goals when marketing to reach such populations. But this is not always the case.[38] This begs the question whether the buyers of homes in these estates are environmentally minded. On this Hostetler & Noiseux (2010) argue that green communities do not necessarily allure residents who are knowledgeable and inspired to maintain the goals set out by these developments. The weight placed on security and privacy was experienced by the researcher when attempting to get estate managers to take part in the online questionnaire survey. Access to some estates was flatly denied.

[38] Examples of this are given in the descriptions of the estates provided in Chapter 4.

As part of the maintenance of the estates, 67% of the estate managers indicated that some kind of pesticide is used in the estate. The majority (61%) of the managers stated that they use herbicides,[39] with eco-estate H using fungicides.[40] According to the estate managers, the herbicides are used on alien plants, on paved roads and pathways to kill weeds, perimeter electric fences and to prevent eucalyptus trees from re-sprouting. In eco-estate H the fungicides on the golf greens are used to prevent fungi. The next section focuses on the disposal of garden waste and other waste products.

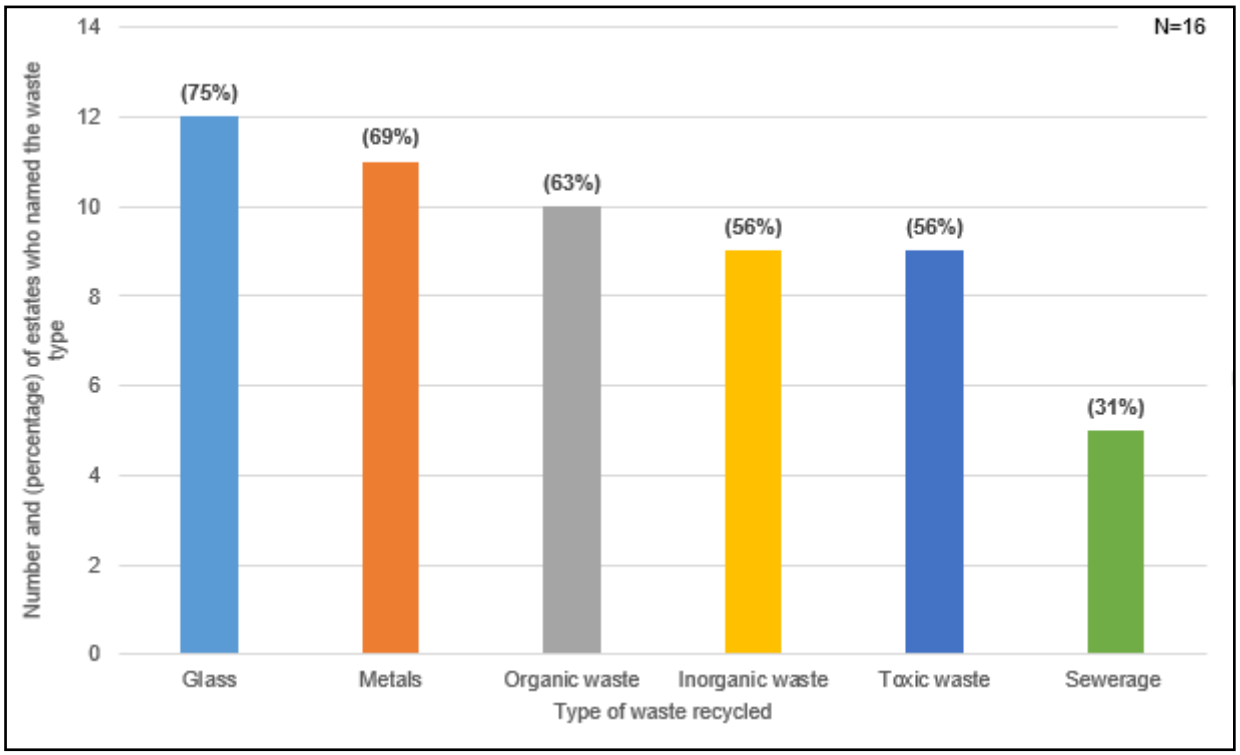
5.2.4 Waste reduction practices

Environmental impacts can significantly be reduced through recycling and the reduction of waste. Therefore, green buildings aim for zero waste in the entire building life cycle. The eco-estates and eco-friendly estates do of course generate large amounts of waste. Figure 5.5 shows the types of waste reported to be recycled by eco-estates and eco-friendly estates. Three out of four estates reported glass is recycled followed by metals, organic waste, inorganic waste, toxic waste and sewerage. Most of this waste can be successfully be recycled on-site should the estate guidelines prescribe it. However, 56% of the estates do not have any sort of on-site recycling programme. Furthermore, none of the estate guidelines which were accessible had any information regarding specific, mandatory practices for waste. Sherriff-Shüping (2015) reported a similar situation in Johannesburg but did find one eco-estate which had guidelines for the management and disposal of waste.

Sewerage is recycled and reused on eco-estate C and eco-friendly estates 1 and 10 which each have an on-site sewerage treatment plant. Managers of eco-friendly estates 9, 7 and 8 and eco-estates D and H all indicated that their estates recycle their organic waste into compost. Composting facilitates separation at source and provides both economic and environmental benefits, such as reduced volumes of waste, increased biodiversity and decreased methane releases and decreased use of commercial organic fertilisers in gardens (CoCT 2011).

[39] Herbicides are a subgroup of pesticides used to specifically kill plants with a chemical substance (Tu et al. 2001).

[40] Fungicides are a subgroup of pesticides used to specifically to destroy fungi or inhibit their growth (Tu et al. 2001).



Source: Survey of estate managers

Figure 5.6 Types of waste produced in eco-estates and eco-friendly estates that is recycled

Eco-estate G was reported to recycle paper, plastic, glass and garden refuse on-site. Seven out of 11 estate mangers stated that homeowners separate their own waste on-site and are encouraged to do so, however this is not mandatory. In addition to the homeowners separating the waste, eco-friendly estate 2, 7 and 9 reported that the estate operation team separate the waste further. Eco-friendly estate 2 is the only one having a designated refuse room where waste is sorted. The waste of five out of 13 estates waste is collected by their local municipality. Eco-friendly estate I's waste is collected by a private company, whereas eco-friendly estate 7 contracts different companies for printer cartridges, e-waste and batteries, and bulbs. Eco-friendly estates 4, 5, 8 and 10 and eco-estates A and G also contracted private companies and eco-friendly estate 3 was unsure. These contracts affirm that these estates contribute towards job creation through recycling, so making contributions to social sustainability.

An important principle of green building is that during construction waste should be reduced by reusing building rubble, old doors and windows (Sev 2009; CoCT 2011). Half of the estates did not answer the question in the survey related to the reuse of construction waste. Of those for which responses were received, five stated that construction waste was simply dumped off-site. The construction of waste of other four estates was reused as backfill when building, for the

rehabilitation of erosion dongas, as road sublayer surfacing and for stormwater controls such as gabion baskets. Points are awarded against the GBCSA rating tool for reusing or recycling a percentage of construction waste and garden waste a dealt with next.

5.2.5 Rating and certification of eco-estates and eco-friendly estates

The GBCSA requires that a garden waste composting facility be on-site. The 18 estates have no such facilities although five have compost heaps in the estate premises. The responses regarding the various practices in the eco-estates and eco-friendly estates confirm that all the estates have adopted some form of green building practices. However, these practices are not meaningful as they are not mandatory requirements for the residents within most of these estates as previously discussed and some of the GBCSA's requirements are not part of the estate guidelines. Therefore, *Finweek* (2012) has contended that if the requirements of eco-estates are measured against GBCSA's rating tool or any other rating tool such as SBAT which was used by Sherriff-Shüping (2015), only a few requirements are ticked off.

Not one of the 18 estates surveyed in this study has applied to the GBCSA for green star rating. Furthermore, the three developers also reported that none of the eco-estates developed by their firms have applied for green star rating. This is surprising as certification or rating bring good publicity and exposure for a developer (Rivera 2009). Four out of five estate managers did, however, indicate that this is 'may be' a future goal but decisions like these ultimately depend on the HOAs. This suggests a positive attitude and perhaps the estate managers plan to take a stand on enforcing rules and regulations that would ensure their estates receive a green star rating. The opinions of the developers were contradictory. Developer A indicated that it is 'may be' a future goal, eco-developer A indicated 'no' and eco-developer B 'yes'. Of course, once a development is complete and is handed over to a HOA the developer then leaves and has no more say.

Apparently, there are differences of opinion among developers about the green star ratings. It is conceivable that developers of eco-estates believe they can boost their profits by including environmental protection in their developments. This contention concurs Sherriff-Shüping's (2015) finding that eco-estates have a little impact on the sustainability of nature and more with making a profit. Milder (2007) and Mockrin et al. (2017) also averred that the estates may be driven by the financial advantage of developers as they are able to demand a price premium for homes in close proximity to open space and areas with amenities, such as coastal areas.

Eco-estates and eco-friendly estates are incontestably the products of ecological modernisation. Ecological modernisation allows for win-win situations where economic growth is stimulated without increasing pollution. The mandatory EIAs these developments have to undergo are central

to ecological modernisation (O'Riordan et al. 2001) and they are a way of ensuring continuous economic competitiveness in a global economy (Carter 2003). In a country saturated with gated communities which offer various lifestyles, eco-estates give developers a distinctive identity to enhance their competiveness in the industry (Sherriff-Shüping 2015).

All three developers admitted that eco-estates do give them such singular identities in the property sector. Their explanations are telling: "[i]t shows our clientele that we care about the environment and it gives them additional comfort in partnering with us." "[i]t helps attract the right type of buyer," "[s]ustainability and conservation are becoming ever more important in buyer's priorities." These reasons highlight the demand for eco-estates or other estates which have a focus on the environment at large. Similarly, World Green Building Trends (2016) reports that two of the top drivers for green buildings was client demands and market demands. The document testifies to an increased awareness and understanding concerning the value of green buildings.

Aside from the awareness of green buildings and sustainability, gated communities in South Africa have been rebranded to eco-estates to garner greater social credibility (Ballard & Jones 2011). They are not examples of a just sustainability or of living in harmony with nature. Their operations and practices are not performed in a just and equitable manner. It could be argued that eco-estates and eco-friendly estates are simply rebranded gated communities. The estates have altered their names to make reference to nature and the environment but on closer examination their practices do not adequately support their branding.

5.3 WHAT THEN IS AN ECO-ESTATE?

The underlying questions of this study were exactly what an eco-estate constitutes and what the difference is between eco-estates and eco-friendly estates. Answers were sought by asking estate managers and developers of eco-estates and eco-friendly estates what their definition of the concept is. This is important as there is no single agreed definition of an eco-estate in the South African context. Previous studies have concluded that this lack of clarity casts doubt in the integrity of the term which results in eco-estates being developed in any means chosen which, in turn, significantly determines the way these estates are advertised (Sherriff-Shüping 2015).

The definitions provided by the three developers are all different but they emphasise different aspects of eco-estates. Developer A defined the concept of an eco-estate: "[a]n environment which combines residential properties and natural eco-systems which are sustainably managed." This definition emphasises the aim of eco-estates to combine conservation and development. Eco-developer A, on the other hand, defined it as: "[a]n estate that promotes indigenous species, water

and electricity conservation." This definition pinpoints on specific green interventions. In contrast, eco-developer B defines an eco-estate as: "[a]n estate that leaves the environment better off after development than before." There are similar undertones in these definitions the goals, aims and ideas all stem from an understanding of a concept in the developer's minds which thus affects the final product.

All the definitions provided by estate managers gave the messages of living in harmony with nature, conservation as a priority and green interventions. Seven definitions carried the idea of living in harmony with nature and two of these (eco-friendly estates 5 and 6) of these also contained elements of conservation and green interventions. These two estates were developed by the same company and share a definition, namely:

> The sustainable development of an area in which the fauna and flora are integrated, conserved and as little as possible damage is made to the ecosystem. Eco-estates are the examples of harmonious living between man and nature. Eco-estates should be implementing the use of alternative resources such as solar power, rainwater catchments etc. But unfortunately that is not always the case.

These two estates also have the lowest rates of participation in green building practices (see Table 5.1), despite both being clearly marketed as an 'eco-estate' on their websites: cases of greenwashing. Table 5.1 shows the incidence of the practices reported for each estate by their managers.

Eco-estate B's definition included elements of conservation and green interventions, namely "[t]o live in harmony with nature, conserve the environment, promote sustainable building practices, encourage residents to be more conscious of the environment." Where eco-friendly estates 5 and 6 state that eco-estates *should* be implementing green building practices, the former definition suggests that the estate merely 'promotes' sustainable building practices. Eco-estate B, is however, is actively engaged in sustainable building practices as evident in Table 5.1. Moreover, the estate buffers a protected area which is vital to fulfilling objectives of these types of developments.

Two of the seven estates combined the ideas of living in harmony with green interventions. Eco-friendly estate 2 defines an eco-estate as "[a]n eco-estate is an estate in which homes are symbiotic with nature…aims to establish this by discouraging light pollution and encouraging sustainable home design, water saving, environmentally sensitive building techniques as well as alternative energy use."

Table 5.1 Eco-practices adopted by the eco-estates and eco-friendly estates

Practices	Eco-estates											
	A	B	C	D	E	F	G	H			Total	% of Total
Land set aside for conservation purposes	X	X	X	X	X	X	X	X			8	100%
Alternative water source	X	X	X	X	X	X	X	X			8	100%
Solar energy	X	X	X	X	X	X	X				7	88%
Indigenous landscaping	X	X	X	X	X	X		X			7	88%
Passive design strategies	X		X		X	X	X	X			6	75%
Energy-efficient lighting fixtures and appliances (communal areas + homes)	X	X	X								3	38%
Greywater recycling	X	X			X	X					4	50%
Buffers protected area		X	X					X			3	38%
On-site compost site				X				X			2	25%
Reuse construction waste	X										1	13%
Artificial concept (golf course, equestrian centre or vineyard)								X			1	13%
Agricultural activity											0	0%
Practices	**Eco-friendly estates**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Total**	**% of Total**
Land set aside for conservation purposes	X	X	X	X	X	X	X	X	X	X	10	100%
Indigenous landscaping	X	X	X	X	X	X	X		X	X	9	90%
Solar energy	X	X	X					X	X		5	50%
Alternative water source	X	X	X				X	X			5	50%
Passive design strategies	X	X					X	X	X		5	50%
Energy-efficient lighting fixtures and appliances (communal areas + homes)	X	X							X	X	4	40%
Greywater recycling	X	X					X			X	4	40%
On-site sewerage plant	X									X	2	20%
Reuse construction waste							X		X	X	3	30%
Buffers protected area	X	X	X								2	20%
On-site compost site							X			X	2	20%
Agricultural activity											0	0%
Artificial concept (golf course, equestrian centre or vineyard)											0	0%

Source: Survey of estate managers

Practices in eco-friendly estate 2 are true to this definition as it is one of the few estates which not only made certain practices mandatory, but also buffers a protected area. Eco-estate C similarly combined notions of living in harmony with green interventions in its definition. It reads:

> The concept of an eco-estate stems from the need to find an appropriate use for the urban-rural transition zone. A use that would provide an effective buffer between conventional suburbia and the agricultural or natural landscape beyond. Such a use would effectively stop the pressure for urban development beyond the site; concentrate on the conservation of the natural features of the site and be of sustainable nature. Eco-estate living is based on a

> philosophy whereby man lives in harmony with nature. This is achieved through careful design, sensitive landscaping, energy efficiency and general conservation.

This definition makes a pertinent reference to the urban-rural[41] transition zone – an area debated at length regarding development. Many gated communities are fiercely criticised for their location which sometimes falls in this zone.[42] However, the eco-estate C definition alludes to the fact that perhaps this zone is meant for the development of eco-estates, especially since they conserve most of their open land compared to developments which blanket over entire areas.

The managers of two other estates provided simple definitions with a focus on living in harmony with nature for eco-estate D "[i]t is an environment with open spaces where residents can live in harmony with the natural fauna and flora." The website of eco-estate D makes no reference to sustainability or living in harmony with nature. Instead, the focus is on marketing the estate's location, however it does engage in a few green building interventions and it is also one of the few estates where organic waste is recycled on-site. Eco-estate G defined an eco-estate as "[a]n environment created to allow co-existence of people residing in such areas with the fauna and flora surrounding it." Whereas this definition makes no reference to green interventions, the marketing text on their website is the complete opposite. Green building practices, such as energy efficiency and sensitive landscaping, were all mentioned. The estate has no mandatory requirements for energy efficiency and the estate manager indicated that they do not make use of alternative energy sources. Clearly there is conflicting information regarding of what the estate markets and what it actually practices.

The definitions of the other eleven estates do not include elements of living in harmony with nature. Instead, either conservation as a priority or green interventions are named, or a combination of both. For example, the definition of eco-friendly estate 1 is: "[w]e are a declared nature conservancy rather than an eco-estate meaning that we are conscious of all flora and fauna and largely abide by the rules and regulations of CapeNature, SANParks etc…". Whereas this estate is called a nature conservancy, it is clearly marketed as an *eco-estate* on their website and in their

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[41] "The rural-urban fringe is the zone of transition in land use, social and demographic characteristics, lying between (a) the continuously built-up urban and suburban areas of the central city, and (b) the rural hinterland, characterised by the almost complete absence of nonfarm dwellings, occupations and land use, and of urban and rural social orientation; an incomplete range and penetration of urban utility services; uncoordinated zoning or planning regulations; areal extension beyond although contiguous with the political boundary of the central city; and an actual and potential increase in population density, with the current density above that of surrounding rural districts but lower than the central city" (Pryor 1968: 206).

[42] See Section 4.2 for this discussion.

architectural guidelines. Furthermore, it is marketed as: "[t]he most environmentally aware and best luxury development in the world." The estate has the most green building practices and it is one of the three estates which has an on-site sewerage treatment plant. Furthermore, it buffers a protected area and does not have any agricultural activity on site, nor has it introduced an artificial concept such as golfing (Table 5.1). According to Koblitz's (2006) criteria this constitutes a 'pure' eco-estate.

The response from the manager of eco-friendly estate 9 was that "[a] residential estate with environmental sustainable area dedicated to conservation." This estate lives up to this claim in that it has the third most (85%) undeveloped land within the estate of all the estates. The estate is also engaged in a fair number of green building practices and more will be implemented. Regarding eco-estate A "[t]he majority of the estate will remain undeveloped with natural vegetation and wildlife. Recycling programmes in place, indigenous vegetation and building restrictions." Seventy percent of land in eco-estate A is undeveloped and however it has a landing strip it is an eco-estate and an aero estate. Despite the high recreational use, this estate is one of a few which has made green building practices mandatory.

While focusing solely on green building practices, eco-friendly estate 8 defines an eco-estate as: "[a]n eco-estate embraces its core functions, infrastructure, management and operational techniques and protocols, centered on ecologically sustainable methods that bring about the most desired result whilst having the most positive environmental impact possible." However, the estate does not practice many green interventions. In contrast, eco-estate H concentrates on conservation: "[a]n Eco Estate is a housing estate that has been developed with conservation considered a priority. This would require complete co-operation with the relevant wild life authority, in our case Ezemvelo Trust." Eco-estate H has a golf course and is the only estate in the study that has an artificial concept. Nearly two thirds of the land is maintained in an undeveloped state. Despite its definition's focus on conservation, it has adopted more green practices than eco-friendly estate 8.

These definitions attest to there being no real difference between an eco-estate and an eco-friendly estate. They share the same practices and goals, although sometimes eco-estates appear to be more specific regarding green building. This concurs with the comment by developer A that "[n]ature estates focus mostly on conserving of open space without introducing manicured gardens etc., while eco-estates focus more on green building." The latter part of this comment is true, but the former part does not accord with the results of this study.

On average the eco-friendly estates have 54% of the land in their developments undeveloped. Whereas the average proportion of undeveloped land in eco-estates is 63%. This is a fundamental

difference between the two types of estates. Once can conclude that eco-estates and eco-friendly estates do consider conservation as a priority but the means of achieving this prioritised goal differ in the sense that some do and some do not take part in certain green building practices which enhance nature conservation. Perhaps, for some estates the mere fact of leaving land undeveloped is 'conservation'. The fundamental difference between the two types of estates is the amount of undeveloped land. Therefore, the two types of eco-developments can be categorised differently.

5.3.1 Categorisation of eco-estates and eco-friendly estates in South Africa

The insights from the literature reviewed in Chapters 2 and 3 along with the results of the analyses presented in chapters 4 and 5 provided a basis for categorising the estates, that is objective 3. Where Milder (2007) created a typology of conservation development in the USA, it is not feasible to use the same categorisation in South Africa where the context is very different. Table 5.2 describes six categories of eco-estates in South Africa.

Table 5.2 Categorisation of eco-estates and eco-friendly estates in South Africa

Category 1: eco-estate	**Category 2: eco-neighbour estate**	**Category 3: eco-friendly estate**	**Category 4: eco-conscious estate**	**Category 5: eco-conscious estate with an artificial concept**	**Category 6: eco-orientated resort**
Developed on a greenfield site, this estate only has 1-5 homes per hectare. It has a priority to conserve on a landscape level and promote living in harmony with nature by conserving 50% or more of its buildable land and adopting green building practices throughout its building cycle and introduces no artificial concepts or agricultural activity.	Developed on a greenfield site, this estate density may vary, however it does conserve 50% or more of its buildable land, buffers a protected area and adopts some green building interventions.	Developed on a greenfield or brownfield site, this estate density may vary, however it does conserve 50% or more of its buildable land and adopts some green building interventions.	Developed on a greenfield or brownfield site, this estate conforms to the usual 20-plus homes per hectare found in other gated communities. It has less than 50% of its buildable land conserved, with a limited number of green interventions.	Developed on a greenfield or brownfield site, this estate conforms to the usual 20-plus homes per hectare found in other gated communities, however it may vary depending on the artificial concept the estate chooses to introduce. The estate has less than 50% of its buildable land conserved with a limited number of green interventions and an artificial concept, such as golfing.	Developed on a greenfield site, this estate conforms to the usual 20-plus homes per hectare found in other gated communities and is relatively dense. It is a mix of housing types, combined with resort-like amenities such as a hotel or golfing. This resort-type development has less than 50% of its buildable land conserved, with limited green interventions.

Source: Adapted from Milder (2007)

This categorisation places these developments on a continuum from a true eco-estate to lower forms of eco-estates. However, categories may overlap. The classification is based on the information gathered given by the survey respondents and the theories pertaining to eco-estates. Eco-estates in South Africa must at least adopt a more holistic outlook on sustainability. The way they are currently presented does not equate to just sustainability. Certain theoretical underpinnings or practices will have to be updated and adapted to conform to current contexts in South Africa.

This is not a comparison study with Milder's (2007) America study which used different variables. This is a proposed categorisation applicable to South Africa and does not divulge as much detail as Milder's (2007) typology of eco-estates. It does not include project proponents, the economic model or public policies. Further analysis and improvements need to be added to the categorisation. Table 5.2 applies the six categories of eco-estates in South Africa to the 18 estates who participated in the online questionnaire survey.

Table 5.3 Proposed categorisation applied to the 18 estates

Estate	**Category 1, 2, 3, 4, 5 or 6**
Eco-estate A	3
Eco-estate B	2
Eco-estate C	2
Eco-estate D	3
Eco-estate E	3
Eco-estate F	3
Eco-estate G	3
Eco-estate H	2
Eco-friendly estate 1	2
Eco-friendly estate 2	2
Eco-friendly estate 3	4
Eco-friendly estate 4	4
Eco-friendly estate 5	4
Eco-friendly estate 6	4

Estate	Category 1, 2, 3, 4, 5 or 6
Eco-friendly estate 7	6
Eco-friendly estate 8	3
Eco-friendly estate 9	3
Eco-friendly estate 10	3

Source: Author

As can be seen from Table 5.2 many (72%) of the estates fall under categories 2 or 3. Categories 2 and 3 are in the higher half of the categorisation. However, eco-estates B and C and eco-friendly estates 1 and 2 all are very close to falling in category 1. These estates have a few outstanding 'requirements' to be called an eco-estate (Table 5.1 shows this). Going forward, eco-estates need to be built with a very specific set of guidelines in order to fit into category 1.

5.3.2 The way forward for eco-estates in South Africa

Two out of three estate mangers opined that eco-estates are the way to move toward sustainable living or housing. Some managers made additional comments like "[y]es if done properly", "[e]xpensive to start, but yes" and "[y]es, we have to protect the environment for future generations and eco-estates allow a closer experience with nature especially to enhance the awareness to nature for kids and youngsters." Two estate managers chose not to answer this question, three managers commented "[w]here possible", "[h]as merit", "[a] relatively small % of the population will want their homes in eco-estates". A forth manager was less curt and remarked at length:

> Not necessarily. Most of the 'sustainable' or 'eco-estate' methods being used are quite superficial in nature, and are largely offset by the vast amount [sic] of un-ecological practices that are overlooked in the areas of construction, storm-water disposal, vegetation management, and so on. Much [sic] of the free-standing private homes in suburbs outside of private estates is where I've seen more substantive, practical, genuine eco-living practices.

All the developers agreed that eco-estates are on a path to sustainable living and housing. They further agreed that eco-estates promote sustainable living outside the estates. Eco-estate developer B commented that: "[o]wners are definitely more eco-aware due to their interaction with fauna and flora on the estate." In contrast 12 managers (67%) disagreed that the eco-estate promote sustainable living beyond the estate boundaries. The manager of eco-friendly estate 8 remarked on his estate "[i]t does not, as it is self-interested." This flies in the face of sustainability. Sustainable development by definition includes others (future generations) and it is a requirement to not be self-interested. Moreover, this observation re-emphasis the finding that eco-estates and eco-

friendly estates do not contribute towards just sustainability. Eco-estates and eco-friendly estates are the attempts of an eco-urbanism model. It is significant to recall Hodson & Marvin's (2010) contention that these developments do not provide ecological security at a city or global level. Instead those who are able to afford to 'care' about the environment are able to ensure ecological security for themselves. Three managers did not answer the question and another three replied "[t]his remains individual choice", "[c]ollaborate with other developers" and "[e]specially toward water usage" respectively. A truly sustainable development endeavours environmental, social and economic benefits, not only on those residing within the development, but also on the greater community.

All three developers indicated that surrounding areas and communities do benefit from sustainable activities within the estates. Eco-estate developer B reflected that: "[t]hrough reduced development footprints and aesthetic improvements. We have also managed to stop all poaching on our and neighbouring properties due to security measures and activity around our fence." In contrast, the managers of eco-friendly estates 5 and 6 indicated that the only 'benefit' is that "[p]oaching is flourishing (sarcastic, but true)." Perhaps these estates have not invested in adequate security measures. Twelve estate managers conceded that the surrounding communities are not benefitting in any way. While others mentioned that surrounding communities benefit from "[j]ob creation and an aids clinic provided by the estate", "[c]onservation of green corridors and links", "[m]ore animals come down the mountain to drink the water at our watering holes", "[c]ommunity groups walking through the estate to observe the wildlife" and "[l]abour".

Eco-developer B highlighted the current water shortage issues in the country and has consequently incorporated appropriate measures into the design of the next phase of their eco-estate to include an on-site plant that will increase treated water supply into the dams for irrigation purposes. Developer A commented that "[t]echnology improvements and cost reductions which promote the implementation of eco-friendly development" are the current and future changes that can be expected. It is hoped that this indicates that future developments of this nature may include more green building practices or green interventions. It is vital though, that developers retrofit existing developments as much as they can. But LeGates & Stout (2015) have cautioned that existing, bigger and less efficient buildings will cost more to green. Consequently, it is uncertain whether developers will exercise the opportunity to retrofit existing developments.

This may explain why the seven estate managers who responded that changes are occurring and will occur in the future are mainly small changes or add-ons, with only one estate indicating large changes. Three of the seven managers indicated that they will be investing in rainwater tanks and

will be promoting the harvesting rainwater and greywater. Eco-friendly estate 2 and eco-estate D are currently increasing the size of their developments. It is hoped that these new phases of development will be ecologically inclined and sustainable. In eco-estate G there are major plans "[t]o design and implement an efficient compost/worm breeding facility, a sewerage/grey water reworking facility on-site, efficient stormwater and rainwater harvesting and introduce solar heating for the clubhouse facility and employee change rooms." If these changes are successful they will prove to be greatly beneficial for eco-estate G because currently it does not have many green interventions in place.

5.4 CONCLUSION

This analysis of eco-estates and eco-friendly estates in South Africa has revealed that they all participate in green building practices. All of the studied estates in this study contribute to some sort of greening intervention. The practices are probably fuelled by the desire of developers to build eco-estates. While their motivations are mixed, they all aimed to render a positive impact on the environment. Furthermore, the developers' motivations supported their goals in that they were all aimed at conservation, with the eco-estate developers emphasising green interventions in their quests to achieve their goals. Significantly, however, all the developers' priorities remain the same.

The majority of the estates are participating in energy-efficient practices, water-efficiency practices and waste reduction practices. There are no major differences between the number of green interventions adopted by eco-estates and those adopted by eco-friendly estates. Whereas estates have adopted green building practices, not all have made these practices or interventions mandatory. Because the eco-estates and eco-friendly estates are marketed as being sustainable to some extent it is incumbent on them to have stringent rules and regulations for homeowners to support this notion. Perhaps the lack of a universally accepted definition creates confusion in the minds of estate managers about the optional practices which should be included in the estates and the practices which should be mandatory. Despite this definitional problem, there is consensus among estate managers and developers that the notion of an eco-estate is the best possible way of developing in the future. However, this needs to be done correctly and in the absence of a universally accepted definition. The prospect is that various types of eco-estates may emerge, but the risk is that their true potential may be far-fetched. This thesis is now concluded in the next chapter.

CHAPTER 6 CONCLUSION

This chapter commences by summarising the main findings in light of the study aim and objectives. Some recommendations for policy, practice and future research are made and several limitations are noted. The report is concluded with some final remarks.

6.1 REVISITING THE OBJECTIVES

The study's was to investigate whether estates branded as eco-estates are different to those described as being eco-friendly or environmentally conscious in their marketing material. In pursuing this intention the first of four objectives to review the relevant literature review as reported in Chapter 3. The sustainability paradigm was shown to have greatly influenced the emergence of eco-estates and the way buildings are being constructed and how resources are allocated. These have impacted developers' decisions and has spurred on the development of eco-developments and green buildings. The lack of a universally accepted definitions of sustainable development, gated communities and eco-estates was revealed in reviewing the literature. The freedom given to developers in establishing eco-estates, largely influences the extent to which they are actually sustainable.

The second objective was to undertake a locational analysis of eco-estates and eco-friendly estates in South Africa. It was addressed in Chapter 4 along with objective the third objective to determine if eco-estates and eco-friendly estates are contiguous with existing conservation areas. South Africa's largest metropolitans were found to have the most estates. The Western Cape is the premier home to eco-estates, followed by Gauteng and KwaZulu-Natal. A direct relationship was found between the contribution to GDP per province and the number of estates. Homes in these estates are potentially second homes and since the estates are usually located on the periphery of cities where they cater for the upper-class who can afford this 'urban-escape' lifestyle. Therefore, eco-estates, like other gated communities, have reproduced exclusionary geographies so creating an unequal and unjust society.

It was established that developers prefer to develop these estates on greenfield sites on the urban periphery and along the South African coastline in towns and secondary cities with large open spaces and breathtaking scenery and other amenities such as closeness to national roads and top schools. These properties will always have price premiums. This points directly to the commodification of nature and to the reality that eco-estates are products of ecological modernisation. The residents from these estates are increasingly auto-dependent, which calls into question the concept of 'eco-living' and the sustainability of these developments. The sense of eco-ness is only present behind the walls of these developments and not beyond.

Large, undeveloped open space is what fundamentally sets eco-estates and eco-friendly estates apart from each other and other gated communities. The eco-estates were found to have more undeveloped land compared to the eco-friendly estates. Therefore, these estates are purposely located adjacent to some form of protected area. Fifteen percent of the estates were found to be within a 1 km proximity to a protected area and 47% in a 0-5 km proximity to a protected area. (Table B.1 in Appendix B details the findings of the analysis). Some of the estates do not directly share a boundary with a protected area or adjacent development but the estate managers reported that there are often links between their property and the protected areas and/or adjacent developments. However, due to security considerations, these links do not always enable the movement of fauna and flora. This disrupts the ecology and defeats the purpose of eco-estates which aim to create contiguous protected areas.

The third objective was to investigate the degree to which eco-estates and eco-friendly estates contribute towards greening interventions. In light of potential ecological impacts of eco-estates, the energy, water and waste practices conducted in the eco-estates were assessed. Regarding energy-efficiency the majority of the eco-estates and eco-friendly estates participate in energy-efficiency practices of some sort, either alone or in combination with others like energy efficient lighting and appliances and alternative energy. Compared with other studies this research found an increase among the use of solar photovoltaic panels. Passive design, such as orientation, shading, ventilation and glass selection, were found to have been adopted by some estates.

Regarding water efficiency, the most popular alternative water source was rainwater stored in tanks. This water is used to irrigate gardens and for household use. Other popular alternative sources of water were groundwater and greywater. A range of processes have been adopted to ensure minimal water usage, for example reduced flow mechanisms. Most of the estates performed poorly regarding waste reduction practices. This is a performance area which can easily be controlled with the imposition of rules and regulations. Separation at source is encouraged but it is not mandatory. The same applies to energy and water efficiency practices not all of which are mandatory. As eco-estates and eco-friendly estates they are marketed as being sustainable (to some extent). Consequently, it is expected that stringent rules and regulations be put in place for homeowners to support this notion.

Objective 4 aimed to categorise eco-estates and eco-friendly estates. Based on appropriate theory, the insights gained from the literature review and the findings of the online questionnaire surveys a categorisation of six types of existing eco-estates in South Africa was devised with developments arranged on a continuum: from a true eco-estate to lower forms of eco-estates in which categories may overlap. Category 1: eco-estate; Category 2: eco-neighbour estate; Category 3: eco-friendly

estate; Category 4: eco-conscious estate; Category 5: eco-conscious estate with an artificial concept; and Category 6: eco-orientated resort.

Eco-estates in South Africa should take on a more holistic sustainability outlook and certain theoretical underpinnings or practices must be updated to conform to current contexts in South Africa, such as the incorporation of just sustainabilities alongside eco-form and eco-urbanism models. This study has built the foundation for answering the underlying question of what constitutes an eco-estate. The study revealed that there is an underlying theme of 'no definition'. The lack of clarity on key concepts all influences the way in which eco-estates are developed and marketed. The various definitions have given birth to different types of eco-estates or developments referred to as being 'eco' in one way or another. Furthermore, the lack of a supporting framework for these estates only exacerbates issues surrounding the development of eco-estates in South Africa.

6.2 POLICY RECOMMENDATIONS

It is recommended that a context-specific definition be formulated and adopted. This definition should inform a guiding framework for developing eco-estates. It must include rules and regulations to be followed by developers, estate managers, residents and other key stakeholders. The rules and regulations should be based on the discourse on sustainable development and they must include green interventions. Application must be made for green building certification. This will help ensure that eco-estates, which have much potential, are able to fulfil their aim of providing residential housing which is in harmony with nature.

Agricultural activities are prohibited in the eco-estates. This alludes to a very 'selective sustainability' produced by these estates. Therefore, these estates do not conform to the notion of 'just sustainabilities'. Considering that gated communities are continuously being criticised for infringing the availability of high-potential agricultural land, allowing diverse land uses may be an option. If food is grown in these estates, it should be grown for others too – this will make it inclusive.

6.3 RECOMMENDATIONS FOR FUTURE STUDIES

Closer study of residents' gardens in eco-estates in which fruits and vegetables are growing is a fruitful avenue for future research. Also, the extent to which these garden spaces are manicured or kept in a natural state is open to study.

Future research should investigate the different development forms which adopt the prefix 'eco-' in their official names, as the fashion is not only limited to gated communities but to businesses, hotels and resorts too.

The spatial analysis revealed that eco-estates are attracted to locations near to top schools in the country. Aside from wanting to escape the rush of urban life, people may be relocating to exurban areas for the schools. This could be examined more closely.

6.4 LIMITATIONS OF THE STUDY

In creating the database of eco-estates and eco-friendly estates in South Africa the coordinates of each estate were required to map their location. However, some of the estates did not have their own website or an exact address. Therefore, for some estates the mapped locations are approximate. Another problem was that the invitation to participate in the online survey sent as emails which in some cases were rejected by a estate manager's or developer's email address as spam. This eroded the potential number of the participants because the email contained the link to survey site.

This unavailability of participants in investigations of gated communities is a common obstacle to such research (Spocter 2013; 2016). Estate managers who were approached for face-to-face interviews all declined to do so. It was also difficult to find the developers involved in the eco-developments as they tend to be 'hidden'. Their identity and information were not always explicit on websites or in other material associated with the estates. Therefore, only the developers that were traced were contacted to take part in the online survey.

6.5 CONCLUDING REMARKS

Eco-estates have responded to the sustainability call in the sense of moving away from conventional forms of residential development. Development is inevitable and will always have some adverse effects on the environment. Alternative development forms like eco-estates do have the potential to combat or at least ameliorate some of these negative impacts to help ensure a sustainable future. While eco-estates are criticised for their locational choices which contribute to urban sprawl, they necessarily require ample space to be successful. It should be appreciated that these estates protect land that would have been blanketed in by some type of development. Furthermore, these estates adopt various green interventions which reduce their detrimental environmental impacts.

Reduction of the negative effects by a certain percentage cannot solve the world's environmental problems, but if the beneficial interventions become standard practice, it can help. Unfortunately,

it is acknowledged that these estates have commodified nature through preserving this land and this is in no way sustainable. Currently, the eco-ness produced by these estates is largely limited to their inhabitants and not the environment as a whole. This raises the equity deficit of eco-estates, just like that of sustainable planning which does not always seem fair and just. Therefore, while eco-estates may be able to respond to some of the environmental impacts of development, social and economic issues remain ingrained as in other gated communities. True sustainability will have to make use of holistic measures to harmonise the forms and functions of development with nature.

[Word count: 41 747]

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APPENDICES

APPENDIX A

Ethical clearance approval letter

APPROVAL NOTICE

New Application
26 June 2017

Project number: SU-HSD-004788

Project title: The 'eco-ness' of eco-estates

Dear Anjali Mistry

Your new application received on 15 May 2017 was reviewed by the REC: Humanities and has been approved.

Ethics approval period: 26 June 2017 – 25 June 2020

Please take note of the General Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

If the researcher deviates in any way from the proposal approved by the REC: Humanities, the researcher must notify the REC of these changes.

Please use your SU project number (SU-HSD-004788) on any documents or correspondence with the REC concerning your project.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

FOR CONTINUATION OF PROJECTS AFTER REC APPROVAL PERIOD
Please note that a progress report should be submitted to the Research Ethics Committee: Humanities before the approval period has expired if a continuation of ethics approval is required. The Committee will then consider the continuation of the project for a further year (if necessary).

If you have any questions or need further help, please contact the REC office at cgraham@sun.ac.za.

Sincerely,

Clarissa Graham

REC Coordinator: Research Ethics Committee: Human Research (Humanities).

APPENDIX B

Table B1. Database showing the distance of all categories of eco-estates and eco-friendly estates to the nearest protected area in South Africa[43]

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Springerbaai costal eco-estate	Eco-estate	Western Cape	Mossel Bay Seal Island Reserve	Island Reserve	Cape Nature	21,3
Boskloof eco-estate	Eco-estate	Western Cape	Lourens River	Local Nature Reserve	Local Protected Area	0,2
Monte Christo eco-estate	Eco-estate	Western Cape	Mossel Bay Seal Island Reserve	Island Reserve	Cape Nature	6,4
Breakwater bay eco-estate	Eco-estate	Western Cape	Katrivier Local Authority Nature Reserve	Local Nature Reserve	Local Protected Area	12,4
The brink eco-estate	Eco-estate	Western Cape	Katrivier Local Authority Nature Reserve	Local Nature Reserve	Local Protected Area	12,5
Kleinbos eco-estate	Eco-estate	Western Cape	Mossel Bay Seal Island Reserve	Island Reserve	Cape Nature	23
The lakes security and eco-estate	Eco-estate	Western Cape	Table Mountain National Park	National Park	South African National Parks	0,6
Num num cape estate	Eco-friendly estate	Western Cape	Mossel Bay Seal Island Reserve	Island Reserve	Cape Nature	2,9
Moquini coastal estate	Eco-friendly estate	Western Cape	Mossel Bay Seal Island Reserve	Island Reserve	Cape Nature	11,1

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[43] Protected area information derived from a 'Protected Areas' GIS shapefile received from the Centre for Geographical Analysis at Stellenbosch University.

Table B.1 continued

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Stonehurst mountain estate	Eco-friendly estate	Western Cape	Table Mountain National Park	National Park	South African National Parks	0,4
Tierboskloof nature estate	Eco-friendly estate	Western Cape	Table Mountain National Park	National Park	South African National Parks	0
Bokkemanskloof estate	Eco-friendly estate	Western Cape	Table Mountain National Park	National Park	South African National Parks	0,3
Zevenwacht lifestyle estate	Eco-friendly estate	Western Cape	Brackenfell Local Nature Reserve	Local Nature Reserve	Local Protected Area	5,7
Baronetcy estate	Eco-friendly estate	Western Cape	Tygerberg (Bellville)	Local Nature Reserve	Local Protected Area	1
Pezula private estate	Eco-friendly estate	Western Cape	Garden Route National Park	National Park	South African National Parks	1,1
Gondwana game reserve wildlife estate	Eco-friendly estate	Western Cape	Ruitersbos Nature Reserve	Forest Act Protected Area	Cape Nature	19
Schoongezicht country estate	Eco-friendly estate	Western Cape	Keurboomsrivier - Seemeeu Broeikolonie	Provincial Nature Reserve	Cape Nature	2,3
Blue rock village	Proposed eco-friendly estate	Western Cape	Hottentots-Holland Mountain Catchment Area	Mountain Catchment Area	Private	3,1
Lynwood estate	Proposed eco-friendly estate	Western Cape	Keurboomsrivier - Seemeeu Broeikolonie	Provincial Nature Reserve	Cape Nature	1,3
Elgin country estate	Proposed eco-friendly estate	Western Cape	Hottentots-Holland Nature Reserve	Forest Act Protected Area	Cape Nature	0,5
Woodlands nature estate	Proposed eco-friendly estate	Western Cape	Paarl Mountain Local Nature Reserve	Local Nature Reserve	Local Protected Area	0,1
Pierpoint nature estate	Proposed eco-friendly estate	Western Cape	Garden Route National Park	National Park	South African National Parks	1,2

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Kompasbaai coastal and eco-estate	Proposed eco-estate	Western Cape	Mossel Bay Seal Island Reserve	Island Reserve	Cape Nature	7,5
Casa maris eco-esate	Proposed eco-estate	Western Cape	Hottentots-Holland Nature Reserve	Forest Act Protected Area	Cape Nature	0
L'Afrique verte eco-estate	Proposed eco-estate	Western Cape	Mont Rochelle	Local Nature Reserve	Local Protected Area	0,4
Highlands eco-estate	Proposed eco-estate	Western Cape	Winterhoek Mountain Catchment Area	Mountain Catchment Area	Private	26,6
Meyersdal eco-estate	Eco-estate	Gauteng	Klipriviersberg Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	4,8
The Gibson eco-estate	Eco-estate	Gauteng	Rietfontein Ridge Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	6,8
Zebra's nest eco-estate	Eco-estate	Gauteng	Rietvlei Dam Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	14,9
Danville eco-estate	Eco-estate	Gauteng	Magaliesberg Protected Natural Environment	Local Nature Reserve	North West Parks Board	1,7
Roodepark eco-estate	Eco-estate	Gauteng	Roodeplaat Dam Provincial Nature Reserve	Provincial Nature Reserve	Gauteng Provincial Government	14,6
Heidelburgkloof nature estate	Eco-friendly estate	Gauteng	Suikerbosrand Provincial Nature Reserve	Provincial Nature Reserve	Gauteng Provincial Government	0,2
Aspen nature estate	Eco-friendly estate	Gauteng	Klipriviersberg Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	2,7

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate/Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Meyersdal nature estate	Eco-friendly estate	Gauteng	Klipriviersberg Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	4
Olivewood estate	Eco-friendly estate	Gauteng	Boschkop Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	5,4
Olivecrest estate	Eco-friendly estate	Gauteng	Boschkop Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	3,7
Waterfall valley retirement estate	Eco-friendly estate	Gauteng	Rietfontein Ridge Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	4,1
The hills game reserve and lifestyle estate	Eco-friendly estate	Gauteng	Roodeplaat Dam Provincial Nature Reserve	Provincial Nature Reserve	Gauteng Provincial Government	8,4
Waterfall country estate	Eco-friendly estate	Gauteng	Rietfontein Ridge Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	5,6
Monaghan farm	Eco-friendly estate	Gauteng	Cradle of Humankind World Heritage Site	World Heritage Site	Gauteng Provincial Government	2,8
Irene glen estate	Proposed eco-friendly estate	Gauteng	Rietvlei Dam Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	1,7
Kado lifestyle estate	Proposed eco-friendly estate	Gauteng	Boschkop Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	0,5
Greenhill estate	Proposed eco-friendly estate	Gauteng	Struben Dam Bird Sanctuary	Local Nature Reserve	Local Protected Area	2,2
Jumanji equestrian and eco-estate	Proposed eco-estate	Gauteng	Bronkhorstspruit Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	2,4

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate/Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Gateway eco-estate	Proposed eco-estate	Gauteng	Klipriviersberg Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	11
Westlake eco-estate	Proposed eco-estate	Gauteng	Harvey Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	8
Grace eco-estate	Proposed eco-estate	Gauteng	Harvey Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	4,5
Cradle view eco-estate	Proposed eco-estate	Gauteng	Cradle of Humankind World Heritage Site	World Heritage Site	Gauteng Provincial Government	2,7
The farm eco-estate	Eco-estate	KwaZulu-Natal	Skyline Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	3
Waterberry hill eco-estate	Eco-estate	KwaZulu-Natal	Aliwal Shoal MPA	Marine Protected Area	Emzemvelo KZN Wildlife	5,5
Simbithi eco-estate	Eco-estate	KwaZulu-Natal	Umhlanga Lagoon Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	24,2
Intaba ridge secure eco-estate	Eco-estate	KwaZulu-Natal	Queen Elizabeth Park Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	13,6
Eshowe hills: Eco and golf estate	Eco-estate	KwaZulu-Natal	Dlinza Forest Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	0,7
Zimbali coastal resort and estate	Eco-friendly estate	KwaZulu-Natal	Umhlanga Lagoon Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	19,6
Hawaan forest estate	Eco-friendly estate	KwaZulu-Natal	Umhlanga Lagoon Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	1
Brettenwood coastal estate	Eco-friendly estate	KwaZulu-Natal	Umhlanga Lagoon Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	28,2

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Dunkirk estate	Eco-friendly estate	KwaZulu-Natal	Umhlanga Lagoon Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	27,4
Hilltop private estate	Eco-friendly estate	KwaZulu-Natal	Umhlanga Lagoon Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	18,7
Zini river estate	Eco-friendly estate	KwaZulu-Natal	Umlalazi Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	1,3
Wozani ridge coastal estate	Eco-friendly estate	KwaZulu-Natal	Mehlomnyama Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	20,5
Ekubu coastal estate	Eco-friendly estate	KwaZulu-Natal	Umtamvuna Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	5
Elaleni coastal forest estate	Proposed eco-friendly estate	KwaZulu-Natal	Umhlanga Lagoon Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	29
Amber lee country lifestyle estate	Proposed eco-friendly estate	KwaZulu-Natal	Midmar Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	4,4
The reeds at balgowan	Proposed eco-friendly estate	KwaZulu-Natal	Karkloof Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	13,7
Falls downe nature reserve and residential estate	Proposed eco-friendly estate	KwaZulu-Natal	Moreleta Kloof Municipal Nature Reserve	Local Nature Reserve	Local Protected Area	3,2
Esebeni eco-estate	Proposed eco-estate	KwaZulu-Natal	Kenneth Stainbank Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	16,2
Shongweni eco-estate	Proposed eco-estate	KwaZulu-Natal	Krantzkloof Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	8
Gessla eco-estate	Proposed eco-estate	KwaZulu-Natal	Umhlanga Lagoon Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	29,2

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Jacana eco-estate	Proposed eco-estate	KwaZulu-Natal	Queen Elizabeth Park Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	2,7
Deo Gloria eco-estate	Proposed eco-estate	Northen Cape	Augrabies Falls National Park	National Park	South African National Parks	94,5
Kenton eco-estate	Eco-estate	Eastern Cape	Waters Meeting Nature Reserve	Provincial Nature Reserve	Eastern Cape Parks Board	1,3
Royalston coastal wildlife estate	Eco-friendly estate	Eastern Cape	Island Nature Reserve	Provincial Nature Reserve	Eastern Cape Parks Board	3,6
Sardinia bay golf and wildlife estate	Eco-friendly estate	Eastern Cape	Sylvic Local Authority Nature Reserve	Local Nature Reserve	Local Protected Area	1,6
The riverview waterfront estate	Eco-friendly estate	Eastern Cape	Kowie Local Authority Nature Reserve	Local Nature Reserve	Local Protected Area	1,6
Kidds beach green estate: Umlele and the village	Eco-friendly estate	Eastern Cape	East London Coast Nature Reserve	Provincial Nature Reserve	Eastern Cape Parks Board	0,7
Cypraea sands estate	Eco-friendly estate	Eastern Cape	East London Coast Nature Reserve	Provincial Nature Reserve	Eastern Cape Parks Board	1
Twin valley nature estate	Eco-friendly estate	Eastern Cape	Noorsekloof Local Authority Nature Reserve	Local Nature Reserve	Local Protected Area	3,3
Crossways farm village	Proposed eco-friendly estate	Eastern Cape	Van Stadens Wild Flower Local Authority Nature Reserve	Local Nature Reserve	Local Protected Area	1,1
Carpe diem eco-estate	Proposed eco-estate	Eastern Cape	Waters Meeting Nature Reserve	Provincial Nature Reserve	Eastern Cape Parks Board	1,2

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Kei river eco-estate	Proposed eco-estate	Eastern Cape	Inyarha Forest Reserve	Forest Act Protected Area	Department of Agriculture, Fisheries, and Forestry	10,8
Mango-grove eco-estate	Proposed eco-estate	Eastern Cape	Lot 1 Kei Mouth State Reserve	Forest Act Protected Area	Department of Agriculture, Fisheries, and Forestry	2,3
Simbali eco-estate	Eco-estate	North west	Faan Meintjies Nature Reserve	Provincial Nature Reserve	North West Parks Board	8,2
Leloko lifestyle estate	Eco-friendly estate	North West	Magaliesberg Protected Natural Environment	Local Nature Reserve	North West Parks Board	19,6
Xanandu nature estate	Eco-friendly estate	North West	Magaliesberg Protected Natural Environment	Local Nature Reserve	North West Parks Board	4,6
Savannah country and wild estate	Eco-friendly estate	North West	Faan Meintjies Nature Reserve	Provincial Nature Reserve	North West Parks Board	7,4
Westlake country and safari estate	Eco-friendly estate	North West	Cradle of Humankind World Heritage Site	World Heritage Site	Gauteng Provincial Government	2,6
Zilkaats estate	Proposed eco-friendly estate	North West	Magaliesberg Protected Natural Environment	Local Nature Reserve	North West Parks Board	1,7
Herondale wildlife eco-estate	Proposed eco-estate	North-west	Boskop Dam Nature Reserve	Provincial Nature Reserve	North West Parks Board	19,4
Hartland eco-estate	Proposed eco-estate	North-West	Magaliesberg Protected Natural Environment	Local Nature Reserve	North West Parks Board	19,6

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Ingwe eco-estate	Proposed eco-estate	North-West	Magaliesberg Protected Natural Environment	Local Nature Reserve	North West Parks Board	0,2
Kwaggasvlakte eco-estate	Eco-estate	Limpopo	Marakele National Park	National Park	South African National Parks	9,2
Ledibeng eco-estate	Eco-estate	Limpopo	D'nyala Nature Reserve	Provincial Nature Reserve	Limpopo Department of Economic Development, Environment and Tourism	6,4
Koedoesdoorns eco-estate	Eco-estate	Limpopo	Pilanesberg Provincial Nature Reserve	Provincial Nature Reserve	North West Parks Board	26,6
Spekboom river estate	Eco-friendly estate	Limpopo	Morgenzon	Forest Act Protected Area	Department of Agriculture, Fisheries, and Forestry	34,6
Motaganeng lifestyle development	Eco-friendly estate	Limpopo	Morgenzon	Forest Act Protected Area	Department of Agriculture, Fisheries, and Forestry	34,6
Hoedspruit wildlife estate	Eco-friendly estate	Limpopo	Motlatse Canyon Provincial Nature Reserve	Provincial Nature Reserve	Mpumalanga Tourism and Parks Agency	20,6
Raptors view wildlife estate	Eco-friendly estate	Limpopo	Motlatse Canyon Provincial Nature Reserve	Provincial Nature Reserve	Mpumalanga Tourism and Parks Agency	16,1
Sable hills eco park	Eco-friendly estate	Limpopo	Motlatse Canyon Provincial Nature Reserve	Provincial Nature Reserve	Mpumalanga Tourism and Parks Agency	15.1
Kransberg highlands international green estate	Proposed eco-friendly estate	Limpopo	Marakele National Park	National Park	South African National Parks	0,5

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Groothoek eco-estate	Proposed eco-estate	Limpopo	Marakele National Park	National Park	South African National Parks	0,4
Moditlo eco-estate	Proposed eco-estate	Limpopo	Motlatse Canyon Provincial Nature Reserve	Provincial Nature Reserve	Mpumalanga Tourism and Parks Agency	13
Nyathi wildlife and eco-estate	Proposed eco-estate	Limpopo	Entabeni Nature Reserve	Provincial Nature Reserve	Department of Agriculture, Fisheries, and Forestry	31,7
Nysloog eco-estate	Proposed eco-estate	Limpopo	Hetbad Nature Reserve	Local Nature Reserve	Local Protected Area	14,2
Clearwater eco-estate	Eco-estate	Mpumalanga	Witbank Nature Reserve	Provincial Nature Reserve	Local Protected Area	6,9
Bonsberg game eco-estate	Eco-estate	Mpumalanga	Methethomusha NR	Provincial Nature Reserve	Mpumalanga Tourism and Parks Agency	10,2
Sabie river eco-estate	Eco-estate	Mpumalanga	Kruger National Park	National Park	South African National Parks	9,9
Brightside eco and aero estate	Eco-estate	Mpumalanga	Kruger National Park	National Park	South African National Parks	20,3
The rest nature estate	Eco-friendly estate	Mpumalanga	Barberton Nature Reserve	Local Nature Reserve	Local Protected Area	7,5
Tenbosch nature estate	Proposed eco-friendly estate	Mpumalanga	Kruger National Park	National Park	South African National Parks	0

Continued overleaf

Table B.1 continued

Name of estate	Eco-estate or Eco-friendly estate	Province	Name of protected area	Type of protected area	Managing agent of the protected area	Distance (km) to nearest protected area
Bezalel eco-estate	Proposed eco-estate	Mpumalanga	Pongola Bush Nature Reserve	Provincial Nature Reserve	Ezemvelo KZN Wildlife	36,4
Broodboom eco-estate	Proposed eco-estate	Mpumalanga	Loskop Dam Nature Reserve	Provincial Nature Reserve	Mpumalanga Tourism and Parks Agency	12,3
St Pauls eco-estate	Proposed eco-estate	Mpumalanga	Wonderkloof Nature Reserve	Forest Act Protected Area	Department of Agriculture, Fisheries, and Forestry	9
Bow-inn eco-estate	Proposed eco-estate	Mpumalanga	Schuinsdraai Nature Reserve	Provincial Nature Reserve	Limpopo Department of Economic Development, Environment and Tourism	7,8

APPENDIX C

Online survey questionnaire for estate managers

The Eco-ness of Eco-estates

Section A:

*Required

1. Please indicate the name of the eco-estate you are responding from (this information will not be used - it is so that the researcher can keep track of the estates) *

_____

2. Q1. Please describe your definition of the concept of an 'eco-estate'? *

_____

_____

_____

3. Q2. Is there a percentage of the development that is undeveloped? *Mark only one oval.*

Yes ⬭ *Skip to question 4.*

No ⬭ *Skip to question 6.*

4. Please state how much of the land is undeveloped? (e.g. 50%)

_____

5. Is any of this land utilised for recreational activities? *Mark only one oval.*

Yes ⬭ *Skip to question 6.*

No ⬭ *Skip to question 7.*

6. Please specify the recreational activities. *Skip to question 9.*

_____

_____

7. What is the land utilised for?

_____

8. Who manages the undeveloped land? For example, is there a land trust, government agency or homeowners association who manages this land?

_____

9. Q3. Are there any ecologically significant features within the development site? Such as a wetland, steep slopes or floodplains? Or habitat and movement corridors, trails/pathways or important historic/cultural sites? *Mark only one oval.*

Yes ⬭ *Skip to question 10.*

No ⬭ *Skip to question 15.*

10. Please specify which ecologically significant features are within the development site

_____

_____

11. Do any of the above features link to adjacent developments/protected areas? Mark only one oval.

Yes ⬭ *Skip to question 12.*

No ⬭ *Skip to question 13.*

12. Are there any processes that was/is gone through to maintain this link? Please explain.

_____

_____

_____

13. Are residents allowed to walk/bike on trails or paths (if any)? *Mark only one oval*.

Yes ⬭ *Skip to question 14.*

No ⬭ *Skip to question 15.*

14. Do residents use this option and what is their general feedback of the trails/paths?

_____

_____

15. Q4. Is there a permanent environmental consultant or nature specialist for the estate? *Mark only one oval.*

Yes ⬭ *Skip to question 16.*

No ⬭ *Skip to question 17.*

16. What are the duties/functions of this person?

_____

17. Q5. How has the estate been marketed? *Check all that apply*.

Brochure ☐

Internet ☐

Newspaper ☐

Magazine ☐

Other: _____

Section B: Water

18. Q6. Is rainwater harvested on-site? *Mark only one oval*.

Yes ⬭ *Skip to question 19.*

No ⬭ *Skip to question 21.*

19. Please explain how the water is harvested.

_____

_____

20. What is this water used for?

_____

_____

21. Q7. Are taps and other water use within the estate water efficient? *Mark only one oval.*

Yes	⬭	*Skip to question 22.*
No	⬭	*Skip to question 23.*
Other: _____		*Skip to question 23.*

22. Q8. What makes them water efficient?

_____

23. Q9. Is grey water collected, recycled and reused in the estate? *Mark only one oval.*

Yes	⬭	*Skip to question 24.*
No	⬭	*Skip to question 25.*

24. Please explain how and where this water is used.

_____

_____

_____

25. Q10. How are communal gardens or green areas watered within the estate and what is the source of this water?

_____

_____

_____

26. Q11. Are there any other means of collecting or saving water that the estate has adopted?

_____

_____

Section C: Land

27. Q12. Has the estate adopted indigenous landscaping? *Mark only one oval.*

Yes ⬭

No ⬭

28. Is there a specific plant list provided for residents and the estate alike? *Mark only one oval.*

Yes ⬭

No ⬭

Other: _____

29. Are there biodiversity corridors for plants linking it to outside the estate?

_____

30. Q13. Are there any animals on the estate (Wildlife)? *Mark only one oval.*

Yes ⬭ *Skip to question 31.*

No ⬭ *Skip to question 32.*

31. Are there any movement corridors for the animals in/out of the estate? Please explain

_____

_____

_____

32. Are there any animals or plants within the estate's boundary that fall under the Red Data list species? *Mark only one oval.*

Yes ⬭ *Skip to question 33.*

No ⬭ *Skip to question 34.*

Maybe ⬭ *Skip to question 34.*

Don't know ⬭ *Skip to question 34.*

33. How are they being protected?

_____

34. Q14. Are pets allowed within the estate? *Mark only one oval.*

Yes ⬭

No ⬭

35. Q15. Who maintains the gardens/communal green areas within the estate?

_____

36. Q16. Does the estate make use of pesticides? *Mark only one oval.*

Yes	⬭	*Skip to question 37.*
No	⬭	*Skip to question 39.*
Don't know	⬭	*Skip to question 39.*

37. Please indicate what type. *Mark only one oval.*

Fungicides	⬭	*Skip to question 38.*
Insecticides	⬭	*Skip to question 38.*
Herbicides	⬭	*Skip to question 38.*
Don't know	⬭	*Skip to question 39.*
Other:_____		*Skip to question 39.*

38. Where are the indicated pesticides used?

_____

_____

39. Q17. Are there communal food gardens or vineyards on the estate? Mark only one oval.

Yes ⬭ Skip to question 40.

No ⬭ Skip to question 41.

40. Is the food produced only accessible by the residents?

_____

Section D: Waste

41. Q18. Please indicate which of the following is recycled: *Check all that apply*.

Toxic waste (Batteries, fluorescent lamps etc.) ☐

Inorganic waste ☐

Organic waste ☐

Sewerage ☐

Metals ☐

Glass ☐

Other: _____

42. Q18.1. Are any of the above recycled on site? If so, please explain

_____

_____

43. Q18.2. How and where was construction waste re-used?

_____

_____

44. Q18.3. Is the waste generated within the estate (private homes and overall estate) separated on site and by whom?

_____

_____

45. Q18.5. Who is the service provider, if any, to collect the recycled waste?

_____

Section E: Energy

46. Q19. Are any of the buildings' energy requirements met from renewable sources? *Mark only one oval.*

Yes ⬭ *Skip to question 47.*

No ⬭ *Skip to question 48.*

47. Please could you elaborate.

_____

_____

48. Q20. Are lighting fixtures and appliances used within the estate classed as highly energy-efficient? *Mark only one oval.*

Yes ⬭ *Skip to question 49.*

No ⬭ *Skip to question 50.*

49. Is this limited to communal areas of the estate or are homeowners also required to use energy efficient appliances and lighting?

_____

50. Q21. Please indicate which passive design features have been considered and applied in the estate and its homes.

_____

_____

_____

51. Q21.1. Has the eco-estate applied to the Green Building Council SA for green star rating? *Mark only one oval.*

Yes ⬭ *Skip to question 53.*

No ⬭ *Skip to question 52.*

52. Is this perhaps a future goal? *Mark only one oval.*

Yes ⬭

No ⬭

Maybe ⬭

53. Q22. In your opinion, are eco-estates the way to move towards sustainable living/housing?

_____

_____

54. Q22.1. Does the estate promote sustainable living outside the estate? Please explain.

_____

_____

55. Q22.2 Are surrounding areas/communities benefitting from any sustainable activities from the estate?

_____

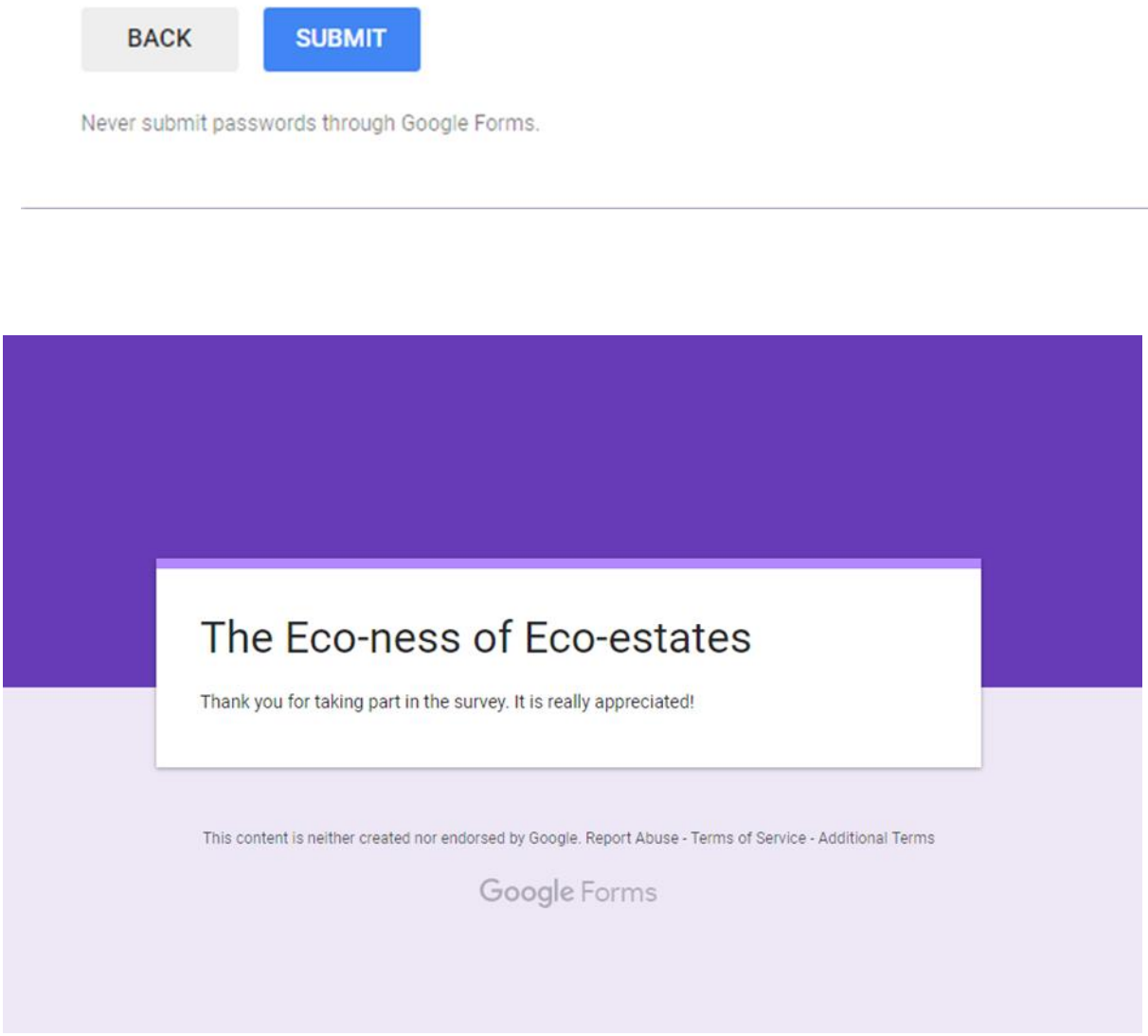
_____

56. Q23. Are there any future changes or current changes occurring on the site that would increase its sustainability points? Give examples/explain

_____

_____

_____



APPENDIX D

Online survey questionnaire for developers

The Eco-ness of Eco-estates

*Required

1. Email address *

_____

2. Q1. Could you please describe your definition of the concept of an 'eco-estate'? *

_____

_____

_____

3. Q2. What was your motivation behind developing an eco-estate?

_____

_____

_____

4. Q2.1. Are there particular goals you aim to achieve through this type of development?
Mark only one oval.

Yes ⬭ *Skip to question 5.*

No ⬭ *Skip to question 9.*

5. Please could you rank your goals.

_____

_____

_____

6. Q2.1.1. If you indicated 'conservation' as a goal, what would you say is the main conservation priority of this type of development, if any?

_____

_____

7. Q2.1.2. Are these goals usually achieved for such developments? *Mark only one oval*.

Yes	⬭	*Skip to question 8.*
No	⬭	*Skip to question 9.*
Sometimes	⬭	*Skip to question 8.*

8. Q2.2. Has your initial vision changed and what caused this changed?

_____

_____

9. Q3. What is the preferred development site for eco-estates? *Mark only one oval*.

Brownfield	⬭	*Skip to question 11.*
Greenfield	⬭	*Skip to question 11.*
Other:	⬭	*Skip to question 10.*

10. Please specify *

_____

11. Q3.1. What informs this decision and the particular location of the development?

_____

_____

12. Q3.2. On average, what percentage of the development is left as undeveloped?

_____

13. Q3.3. Is any of this land utilised for recreational activities? *Mark only one oval.*

Yes	⬭	*Skip to question 14.*
No	⬭	*Skip to question 15.*
Don't know	⬭	*Skip to question 15.*

14. Please specify the kinds of recreational activities the land is utilised for.

_____

_____

15. What is the land usually utilised for?

_____

_____

16. Q3.4. Who manages and funds the undeveloped land in the estate? For example, is there a land trust, homeowners association or government agency who manages this land?

_____

17. Q4. Are eco-estates situated in a way that it is next to a protected area, such as a nature reserve or another eco-estate? *Mark only one oval.*

Yes	⬭	*Skip to question 18.*
No	⬭	*Skip to question 19.*
Sometimes	⬭	*Skip to question 18.*

18. Q4.1. Could you please indicate on average ± how much of the development's border overlaps with the protected area and/or eco-estate.

_____

19. Q4.2. What are the reasons behind establishing a contiguous protected area?

_____

_____

20. Q6. Please indicate which of the following sustainable design features are usually incorporated in eco-estates.

Green building features	⬭	
Indigenous landscaping	⬭	
Stormwater management systems	⬭	
On-site waste management	⬭	
Other	⬭	*Skip to question 21.*

21. Please specify *

_____

22. Q6.1. Have any of the eco-estates developed by your firm applied to the Green Building Council SA for green star rating? *Mark only one oval.*

Yes	⬭	*Skip to question 24.*
No	⬭	*Skip to question 23.*

23. Is this perhaps a future goal? *Mark only one oval*.

Yes	⬭
No	⬭
Maybe	⬭

24. Q7. Who would you say is your target market for such developments?

_____

25. Q8. Do you feel developments, like eco-estates provide you as a developer with a distinctive identity in the property sector? *Mark only one oval.*

Yes ⬭ *Skip to question 26.*

No ⬭ *Skip to question 27.*

26. Please elaborate

_____

_____

27. Q9. In your opinion, are eco-estates the way to move towards sustainable living/housing?

_____

_____

_____

28. Q9.1. What sets this type of development apart from other gated estates or similar estates?

_____

_____

_____

29. Q9.2. Do eco-estates promote sustainable living outside the estate?

_____

_____

_____

30. Q9.3. Do surrounding areas/communities benefit from any sustainable activities from eco-estates?

_____

_____

_____

31. Q10. Are there any future changes or current changes occurring in terms of development activities that would increase eco-estate's sustainability points?

_____

_____

_____

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